FOREIGN DIRECT INVESTMENT AND SUSTAINABLE LOCAL ECONOMIC DEVELOPMENT: SPATIAL PATTERNS OF MANUFACTURING FOREIGN DIRECT INVESTMENT AND ITS IMPACTS ON MIDDLE CLASS EARNINGS

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FOREIGN DIRECT INVESTMENT AND SUSTAINABLE LOCAL ECONOMIC DEVELOPMENT: SPATIAL PATTERNS OF MANUFACTURING FOREIGN DIRECT INVESTMENT AND ITS IMPACTS ON MIDDLE CLASS EARNINGS

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To the memory of my late mother, Youngja Lee

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LIST OF ABBREVIATIONS

ACS	American Community Survey
CBD	Central Business District
ESDA	Exploratory Spatial Data Analysis
FDI	Foreign Direct Investment
FTZ	Foreign Trade Zone
IPUMS	Integrated Public Use Microdata Series
MSA	Metropolitan Statistical Area
NETS	National Establishment Time-Series
PUMA	Public Use Microdata Area
PUMS	Public Use Microdata Sample
SLED	Sustainable Local Economic Development

SUMMARY

Foreign Direct Investment (FDI) in the United States, which predominately occurs in the manufacturing sector, remains critically important for a strong regional and local economy, due to the resulting increase in employment, wages, and tax revenue. Traditionally, local economic development strategies have focused on attracting external manufacturing plants or facilities as the primary route to economic growth, through the expansion of the tax base and/or an increase in employment. In comparison, Sustainable Local Economic Development (SLED) emphasizes the establishment of a minimum standard of living for all and an increase in this standard over time; a reduction in the steady growth in inequality among people; a reduction in spatial inequality; and the promotion and encouragement of sustainable resource use and production (Blakely & Leigh, 2010). These essential SLED principles motivate this study, which will seek to develop a better understanding of whether and how FDI contributes to SLED in terms of its spatial patterns and its impact on middle class earnings. By selecting Georgia as a case study area, this research specifically examines whether and how the location of manufacturing FDI has reduced (or increased) spatial inequality at the intra-state and intra-metropolitan levels. It also identifies whether and how manufacturing FDI has reduced (or increased) inequality among people, focusing on its impact on middle class earnings.

This study finds a strong spatial concentration of manufacturing FDI employment in metropolitan areas, particularly in a large metropolitan area, at the intra-state spatial pattern analysis. The results of panel regression analysis suggest that presence of agglomeration economies in metropolitan areas has positively influenced the location of manufacturing FDI jobs. The study also finds a suburbanization pattern of manufacturing FDI employment in the intra-metropolitan spatial pattern analysis. This intra-metropolitan suburbanization of FDI in manufacturing jobs is associated with loss of urban industrial land in the central areas within a large metropolitan area. These uneven distribution patterns of manufacturing FDI jobs indicate increased spatial inequality at both intra-state and intra-metropolitan levels, but the implications of this finding are mixed.

Using individual earnings data from the American Community Survey Public Use Microdata Sample files, this study also conducts a quantile regression to estimate the earnings distribution effects that a concentration of manufacturing FDI may have on different earnings groups. The findings both from place-of-work and place-of-residence earnings analysis suggest that manufacturing FDI generally has reduced inequality among people. The concentration of manufacturing FDI in a certain area show the largest distribution effects on area workers in the lower earnings group and residents in the middle earnings group.

CHAPTER 1

INTRODUCTION

1.1. Research Background

Although Foreign Direct Investment (FDI) has decreased in recent years, regional and local planners continue to regard it as one of the essential components of the regional and local economy. Often viewed as an "engine of development," FDI creates new jobs; boosts wages; brings in new research, technology, and skills; and increases tax bases (Dunning & Lundan, 2008; Jones & Wren, 2006). U.S. subsidiaries of global companies directly and indirectly employed over 21 million American workers in 2009 and accounted for a significant share of the overall economy in 34 states, representing more than 10 percent of total employment in those states (PWC, 2012). Compensation associated with these 21 million jobs accounted for $1.2 trillion in income in 2009 and for more than 10 percent of total income in 42 states (PWC, 2012).

FDI in the U.S. remains strong in the manufacturing sector, while many U.S. manufacturers have moved their production activity overseas, seeking lower production costs. In 2007, 37% of employment by foreign firms was in the manufacturing sector, more than twice the share of manufacturing employment in the U.S. economy as a whole, with an average annual compensation per worker of about $63,000 (Jackson, 2010). FDI in the manufacturing sector is critically important for a strong regional and local economy because of its larger share of employment, higher wages, and greater proportion of tax revenues as compared with other industry (Helper, Krueger, & Wial, 2012b). When a region's response to the demand for its goods, services, and products from areas outside its economic boundaries directly determines its economic growth, manufacturing

FDI becomes an important engine for such growth, especially as national and global demand for manufacturing products continues to increase. Moreover, because the manufacturing sector has relatively higher economic multipliers, the location of a new foreign manufacturing firm in a particular region–with the resulting increase in new jobs, both directly from the firm and indirectly from local service-providers–would likely create new workforce needs, as well as new housing and community development.

Manufacturing FDI also can be important to overall economic development by reducing inequality among people. Historically, manufacturing has provided a primary source for middle class jobs. Considering the middle class standard of living as a benchmark by which progress in economic development is measured, industrial transformation in the U.S. has had a substantial impact on the American middle class (Leigh, 1994). In short, the disappearance of manufacturing jobs has (in-) directly led to the decline of the middle class. Therefore, attracting and retaining manufacturing jobs is essential for obtaining job security for this class of Americans.

In addition, manufacturing FDI plays a critical role in reducing spatial inequality. Recent data from the U.S. Bureau of Economic Analysis shows a strong spatial concentration of FDI in the South where income levels continue to lag behind other regions of the U.S. In particular, the regional distribution of employment for manufacturing FDI tends to center in the Southern U. S. Although the region's right-to-work laws and lower wages remain controversial, the concentration of FDI in the Southern states has provided significant employment opportunity for the area's workers.

Most studies related to the location of FDI focus on inter-regional differentials, but very few studies attempt to examine the locational patterns of manufacturing FDI at the state or regional level. Applying a longitudinal establishment-level foreign affiliates dataset, this study reveals that FDI employment in Georgia remained stable with an annual average of 70,000 jobs although domestic manufacturing experienced significant job loss from 1990 to 2010. However, the state's 159 counties did not experience an even distribution of FDI-related job creation over this period.

A recent study of the location of American manufacturing jobs determined that U.S. metropolitan areas have become strongly specialized in manufacturing since 1980, compared to non-metropolitan areas (Helper, Krueger, & Wial, 2012a). By 2010, metropolitan areas contained 79.5 percent of American manufacturing jobs. The spatial pattern of manufacturing FDI may show similar results. Metropolitan areas may attract significant manufacturing FDI because these areas offer great advantages of agglomeration, including skilled labor pools, specialized input in the form of local goods and services suppliers, and knowledge spillover.

Further, this study shows that foreign manufacturers in Georgia have steadily provided more than 20,000 jobs in the high-tech sector over the past two decades. High-tech firms typically have unique labor needs, requiring highly educated and trained scientists and engineers (DeVol, 1999; Kimelberg & Nicoll, 2012), and thus the skilled workforce typically provided in metropolitan areas may attract more manufacturing FDI.

This spatial concentration is likely to persist since metropolitan areas, especially large metropolitan areas, contain higher populations and integrate more easily into the global economy, linking up to informational networks and concentrating the world's power base (Castells, 2002; Istrate & Marchio, 2012). Thus, metropolitan areas accommodate the need of high-tech industries to cope with global competition, and an influx of higher wage-seeking skilled labor from non-metropolitan regions serves to diversify the labor force. The benefits of this population agglomeration include the development of improved infrastructure, transportation, communication, and knowledge, as well as increased production input-sharing affecting all industries due to their relative proximity (Krugman, 1993).

However, securing manufacturing FDI can be challenging at the intra-metropolitan level. A growing number of metropolitan areas have initiated “smart growth” as an anti-sprawl development strategy, but this kind of policy does not always complement economic development concerns, such as “keeping manufacturing” strong in the central cities and suburbs (Leigh & Hoelzel, 2012). The areas that adopted such policies lost a substantial amount of manufacturing business and jobs over the last few decades (Helper et al., 2012a; Leigh & Hoelzel, 2012). This study also noted a significant loss of urban industrial land in the center of the Atlanta metropolitan area over the last decade, although new industrial land developments arose in the fringe of the metropolitan area. The loss of industrial land may make central cities and inner suburbs less attractive business locales and thus may contribute to the suburbanization of FDI manufacturing jobs. Therefore, the location and retention of manufacturing FDI in central cities and inner suburbs may become critical to providing an opportunity for higher wage jobs for the people in those areas, especially for the middle class. Moreover, maintaining a balance between jobs and housing can prove to be an energy efficient, environmentally effective strategy by reducing commuting distance for workers.

Traditionally, local economic development strategies have focused on attracting external plants or facilities as the key to economic growth with the hope that new businesses will expand the tax base and/or increase employment. In contrast, Sustainable Local Economic Development (SLED) contemplates "raising standards of living and improving the quality of life through a process that specifically lessens inequalities in metropolitan development and the metropolitan population's standard of living" (Fitzgerald & Leigh, 2002, p. 27). Blakely & Leigh (2010) defined the basic principles of SLED as follows: SLED should establish a minimum standard of living for all and increase the standard over time; SLED should reduce growing inequality among people; SLED should reduce spatial inequality; and SLED should promote and encourage sustainable resource use and production (Blakely & Leigh, 2010).

These SLED principles motivate this study, which seeks to develop a deeper understanding of whether and how FDI contributes to SLED in terms of its spatial patterns and its impact on middle class earnings. This study specifically examines whether and how the location of manufacturing FDI reduces (or increases) spatial inequality at the intra-state and intra-metropolitan levels. It also identifies whether and how manufacturing FDI has reduced (or increased) inequality among people, focusing on its impact on middle class earnings.

1.2. Research Goal, Objectives, and Questions

As noted above, the primary research goal of the study is to identify whether and how FDI contributes to SLED in terms of spatial patterns and its impact on middle class earnings. The research addresses three research objectives and examines a series of specific questions.

The first objective is to examine intra-regional spatial patterns created by manufacturing FDI over time, addressing the following research questions: Is there any evidence of a strong cluster of manufacturing FDI in a large metropolitan area, compared to non-metropolitan areas? If such a pattern exists, how has this spatial pattern changed over time? Is there evidence of suburbanization of manufacturing FDI within a large metropolitan area? If such a pattern exists, how has this spatial pattern changed over time? What are the differences in the intra-regional spatial patterns between foreign and domestic manufacturers? The study identifies these differences in both levels of analysis: intra-state and intra-metropolitan spatial pattern analysis.

The second objective is an investigation of locational factors in determining these spatial patterns of manufacturing FDI over time. Research questions include: What are the important locational factors determining the strong clusters of manufacturing FDI in a large metropolitan area? What are the important factors influencing the suburbanization of manufacturing FDI within a large metropolitan area? In particular, how does urban industrial land loss within a large metropolitan area affect the suburbanization of manufacturing FDI jobs? What are differences in intra-regional locational factors between foreign and domestic manufacturers?

Third, this study explores whether and how the location of manufacturing FDI has reduced (or increased) inequality among people. It addresses following research question: Who benefits more from the concentration of manufacturing FDI jobs? Specifically, do investments by foreign manufacturers increase the individual earnings for the middle class, compared to other classes?

1.3. Overview of Methodology

This study selects Georgia as a case study area for examining the intra-regional spatial patterns of manufacturing FDI and its underlying locational factor, as well as its distribution effects among different earnings groups. This selection is appropriate for several reasons. First, Georgia is historically one of the largest recipients of FDI in the U.S. manufacturing sector. During the past two decades, an annual average of 800 foreign manufacturing plants located in the state provided an annual average of 70,000 jobs. In addition, Georgia has a substantial proportion of foreign manufacturing jobs relative to the total manufacturing employment in the state. In 1990, the share of employment associated with foreign manufacturing plants in Georgia was 9.8 percent of total manufacturing employment, and this share increased to 12.3 percent in 2010.

Second, Georgia's numerous counties vary greatly with respect to population, land, transportation, and industry structures, creating the potential for significant variability in the location of foreign manufacturing plants and their jobs. This study finds that the jobs created by foreign manufacturing plants in the state tend to be distributed unevenly among its counties. FDI manufacturing in Georgia varies significantly across its 159 counties, with the percentage of foreign manufacturing plant jobs in each county ranging from zero to forty-six percent.

Third, 70 counties fall within the state's 15 metropolitan statistical areas (MSAs), whereas the remaining 89 counties fall within non-MSAs (See Figure 1.1). The state also contains one large metropolitan area, the Atlanta metropolitan area, spanning up to 28 counties in north Georgia. As a result, this study can examine whether metropolitan areas may attract substantial manufacturing FDI because of the relative advantages offered by agglomeration in such areas, including a pool of skilled labor, specialized input in the form of local goods and services suppliers, and knowledge spillover. Further, the research can identify whether strong spatial concentrations of manufacturing FDI exist in metropolitan areas and whether the concentrations have become stronger as high-tech employment in those areas increased over time.

Finally, while domestic manufacturing jobs have significantly declined in the past two decades, manufacturing FDI employment was stable in Georgia, allowing this study to identify whether foreign and domestic manufacturing have different effects on local counties in terms of job opportunity and individual earnings.

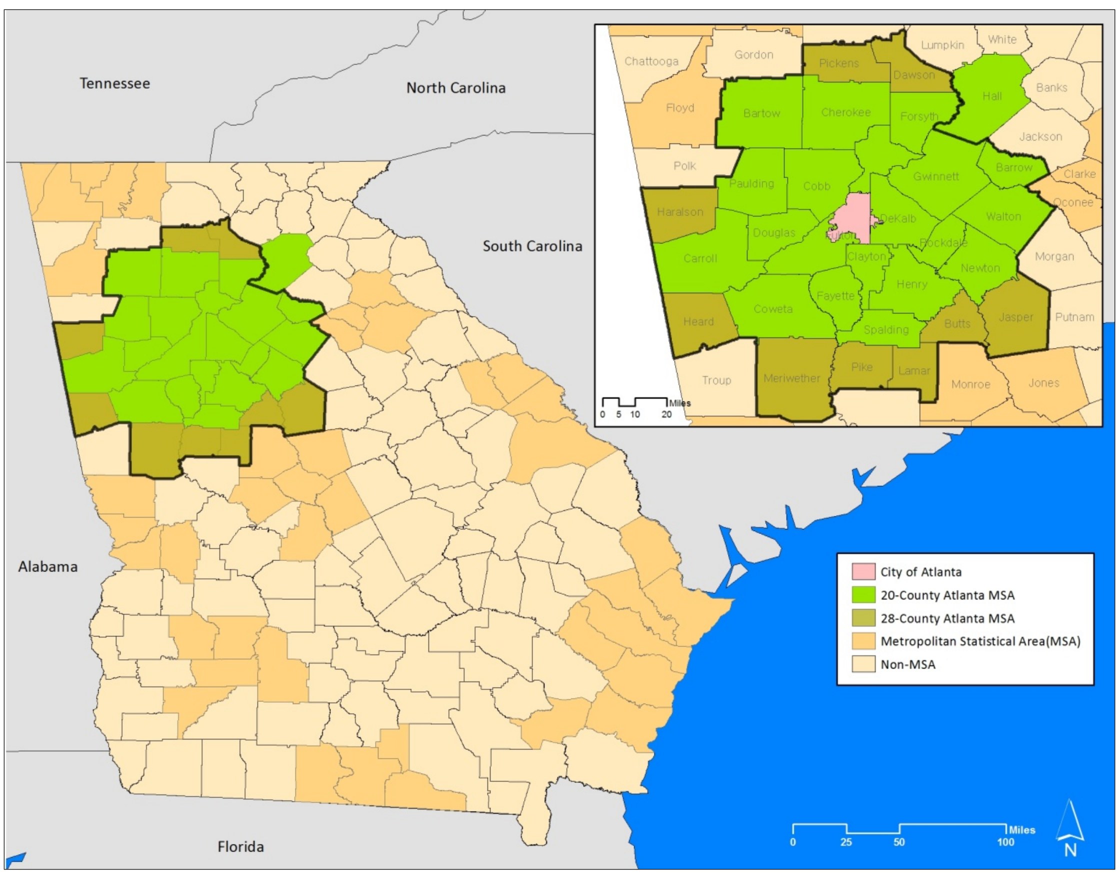

Figure 1.1. Study Area: Counties in Georgia

This study considers the county as the primary geographic unit of analysis for examining the intra-regional spatial patterns and locational factors of manufacturing FDI. Georgia has 159 counties, second only to Texas, although it is only average in total size, ranked 24 out of 50, with 59,425 square miles. As a result, the mean land area per county is much smaller than in other states, allowing a more precise analysis of locational patterns and factors of FDI manufacturing.

The research uses the Public Use Microdata Area (PUMA) as another geographic unit of analysis for measuring the impact of manufacturing FDI on individual earnings across different local communities. The individual earning data is available at the individual level from annual American Community Survey (ACS) Public Use Microdata Sample (PUMS) files from 2004 to 2011, but traditional MSA and county geographic identifiers are not available in the ACS PUMS. Instead, PUMAs are the lowest level of geographic area available. PUMAs have a minimum population of 100,000 and maximum of a little less than 400,000, and the Census Bureau attempted to group similar areas together. Because the analysis separately examines direct and indirect effects of locations of manufacturing FDI on individual earnings, this study uses place of work of PUMAs (POWPUMAs) and residential PUMAs (RESPUMAs), respectively, as a geographic unit of analysis. Figure 1.2 shows the 43 POWPUMAs (or RESPUMAs) identified in Georgia.

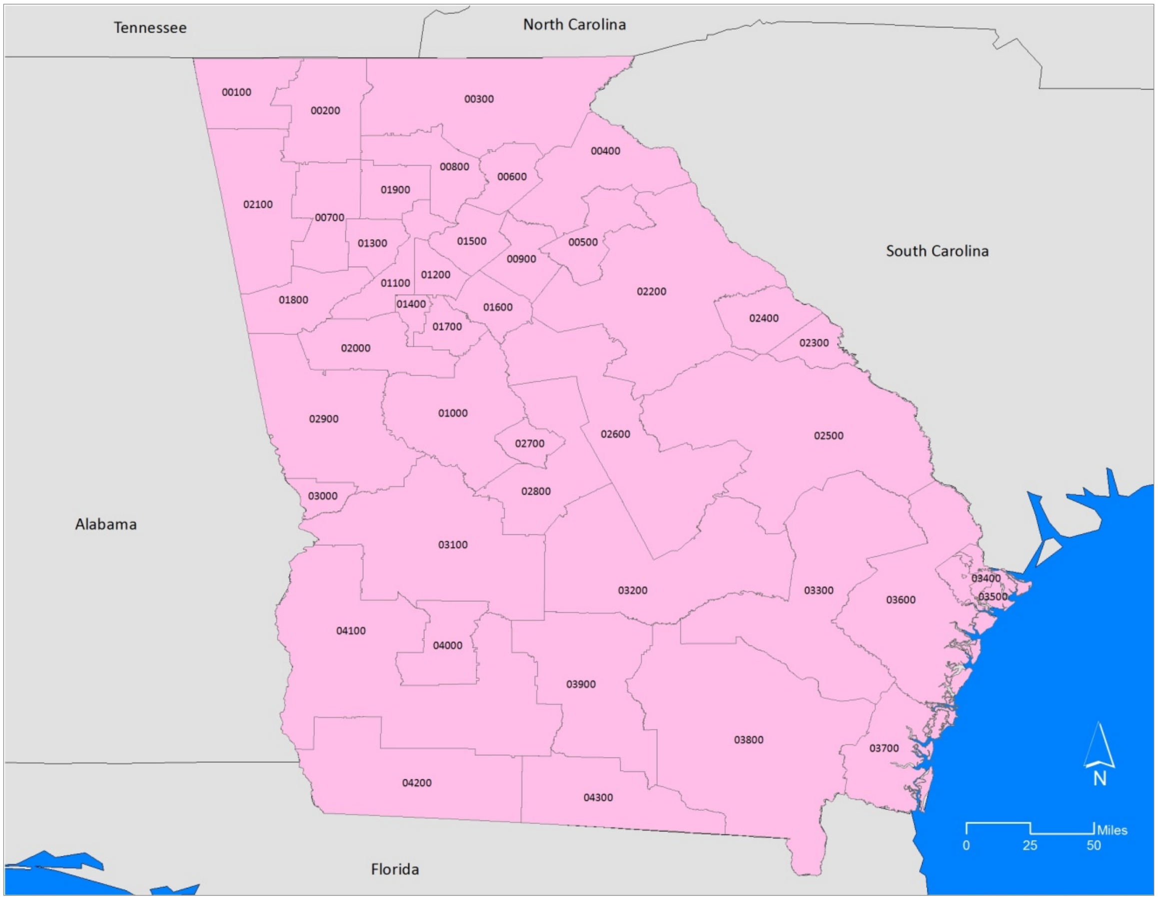

Figure 1.2. Study Area: POWPUMAs (RESPUMAs) in Georgia

The traditional way of measuring locations of FDI in the United States is to focus on differences across state boundaries. Very few studies present analysis of the spatial patterns and locational factors within a state, primarily due to the unavailability of micro-level data. The Bureau of Economic Analysis provides annual statistics on foreign-owned U.S. affiliates. These statistics cover a variety of activities of foreign-owned U.S. affiliates such as home country, industry, sales volume, and employment. However, only state-level data is publicly available, and thus its geographic scale is too large to examine intra-state or intra-metropolitan scale of FDI location.

Most previous studies on industrial location of FDI in the United States relied on cross-sectional data of state, region, or county but did not deal with differences over time because of the limitation in data sources. This study uses a longitudinal establishment-level employment and location of foreign manufacturer based on data from the National Establishment Time Series (NETS) dataset. It allows us the unique ability to measure employment trends and spatial patterns of FDI down to the finest geographic scale possible, using street addresses, and longitude/latitude for each establishment over time.

This study consists of several specific analysis methods to address the three research objectives and to examine a series of specific questions. First, the research begins with an examination of intra-regional spatial patterns created by manufacturing FDI over time using ESDA in GIS, and identifies intra-regional spatial patterns in two different specific analyses: (1) intra-state spatial pattern analysis to examine spatial differentiation of manufacturing FDI between metropolitan and non-metropolitan areas, and (2) intra-metropolitan spatial pattern analysis to examine suburbanization of manufacturing FDI. In addition, the study examines the spatial differentiation between foreign and domestic manufacturing in each level of analysis.

Second, the research establishes a panel data regression model to investigate the locational factors in determining these intra-regional spatial patterns of manufacturing FDI in Georgia over time, by focusing on a county-level comparison. The dependent variable in the panel data models is the number of employees in manufacturing FDI in a given county for a specific year. The study based several types of independent variables that represent location-specific advantages of each county on the findings of some recent and widely cited studies.

Several different specifications exist for the county-level panel data models. By performing the first model for all of the state's 159 counties, the study seeks to identify locational factors in determining the intra-state spatial patterns of manufacturing FDI over time. This study carries out specific panel regressions using all, high-tech, and non-high-tech FDI employment as dependent variables. The second model intends to identify the locational factors within the 20-county Atlanta metropolitan area to address the research question of how urban industrial land loss influences the suburbanization of FDI in manufacturing jobs in a large metropolitan area. The study also employs all, high-tech, and non-high-tech specifications in the intra-metropolitan locational factor model. The remaining models seek to identify the locational factors differentiation between foreign and domestic manufacturing in each level of analysis, i.e., intra-state and intra-metropolitan locational factor differentiations.

Finally, this study explores whether location of manufacturing FDI has reduced (or increased) inequality among people. It does not measure inequality directly. Instead, using quantile regression, it examines the effect of concentration of manufacturing FDI on earnings distribution among different earnings groups.

Table 1.1 summarizes specific analysis methods used in this study to address the three research objectives. In addition to the series of specific research questions previously identified, each objective has a hypothesis, as discussed below. The research questions and hypotheses define the study area, geographic unit of analysis, time period, methodology, and variables.

Table 1.1. Summary of research methods

Research objective	Intra-regional Spatial Pattern*			Intra-regional Locational Factor*			Impact on Middle Class Earnings	
Model	Intra-state spatial pattern of FDI	Intra-metropolitan spatial pattern of FDI	Spatial differentiation between foreign and domestic	Intra-state locational factors of FDI	Intra-metropolitan locational factors of FDI	Locational factors differentiation between foreign and domestic manufacturing	Place-of-work earnings model	Place-of-residence earnings model
Research Question	Spatial differentiation between metropolitan and non-metropolitan	Suburbanization of manufacturing FDI	Spatial differentiation between foreign and domestic manufacturing	Locational factors within 159 counties in Georgia	Loss of urban industrial land and suburbanization of FDI	Locational factors differentiation between foreign and domestic manufacturing	Distribution effects on earnings of those who work in the POWPUMA	Distribution effects on earnings of those who live in the RESPUMA
Study area and geographic unit	159-county Georgia	28-county Atlanta MSA	· 159-county Georgia · 28-county Atlanta MSA	159-county Georgia	20-county Atlanta MSA	· 159-county Georgia · 20-county Atlanta MSA	43 POWPUMAs in Georgia	43 RESPUMAs in Georgia
	plant-level; zip code-level; county-level			County-level			POWPUMA-level	
Time period	1990-2010 (annual)			1990-2010 (annual)	1999-2010 (annual)	· 1990-2010 (annual) · 1999-2010 (annual)	2005-2010 (annual)	
Method	Exploratory Spatial Data Analysis			Panel data regression			Quantile regression	
Dependent variable				Manufacturing FDI employee (All, high-tech, and non-high-tech)		· Manufacturing FDI emp. · Domestic manufacturing emp. (All, high-tech, and non-high-tech)	· Individual earnings for different earnings groups	
Independent variable				19 variables	13 variables	· 18 variables · 13 variables	· Manufacturing FDI emp. · Domestic manufacturing emp. · Individual characteristics	

1.4. Research Organization

This study consists of six chapters as shown in the research organization chart in Figure 1.3. The first chapter introduces the background of the issues, addressing the need for research linking FDI to SLED, and identifies the research goal, objectives, and questions. It also briefly describes the research methodology.

The second chapter presents a review of the literature, beginning with theories and key concepts of FDI. The chapter then discusses key concepts of the manufacturing sector and middle class. The last part of the chapter explains the concept of SLED and theoretical concepts linking manufacturing FDI and SLED.

Chapters Three through Five present the empirical analysis and findings. Specifically, Chapter Three explores the intra-regional spatial patterns of manufacturing FDI in Georgia from 1990 to 2010, as identified in two different, specific analyses: spatial differentiation between metropolitan and non-metropolitan areas and intra-metropolitan suburbanization. The chapter also examines the spatial differentiation between foreign and domestic manufacturing in each level of analysis.

Chapter Four provides the results of the county-level panel data regression model seeking to identify locational factors in determining the intra-regional spatial patterns of manufacturing FDI. It focuses on four different specifications. The study performs the first model for all of the state's 159 counties and runs the second model for the 20-county Atlanta metropolitan area to examine the effects of urban industrial land loss and suburbanization of FDI in manufacturing jobs in such an area. In the third and fourth models, the chapter identifies whether different intra-regional locational factors exist for foreign and domestic manufacturing.

While Chapters Three and Four provide a specific examination of whether and how locations of manufacturing FDI have reduced (or increased) spatial inequality at the intra-state and intra-metropolitan levels, Chapter Five identifies whether and how manufacturing FDI has reduced (or increased) inequality among people, focusing on its impact on middle class earnings. A quantile regression model in the chapter examines how manufacturing FDI and domestic manufacturing investment affect individual earnings for the middle class, as compared to the lower and upper classes, and explores any differences between the two.

Chapter Six also summarizes the research findings and discusses the policy implications for planners and policy makers to contribute to SLED.

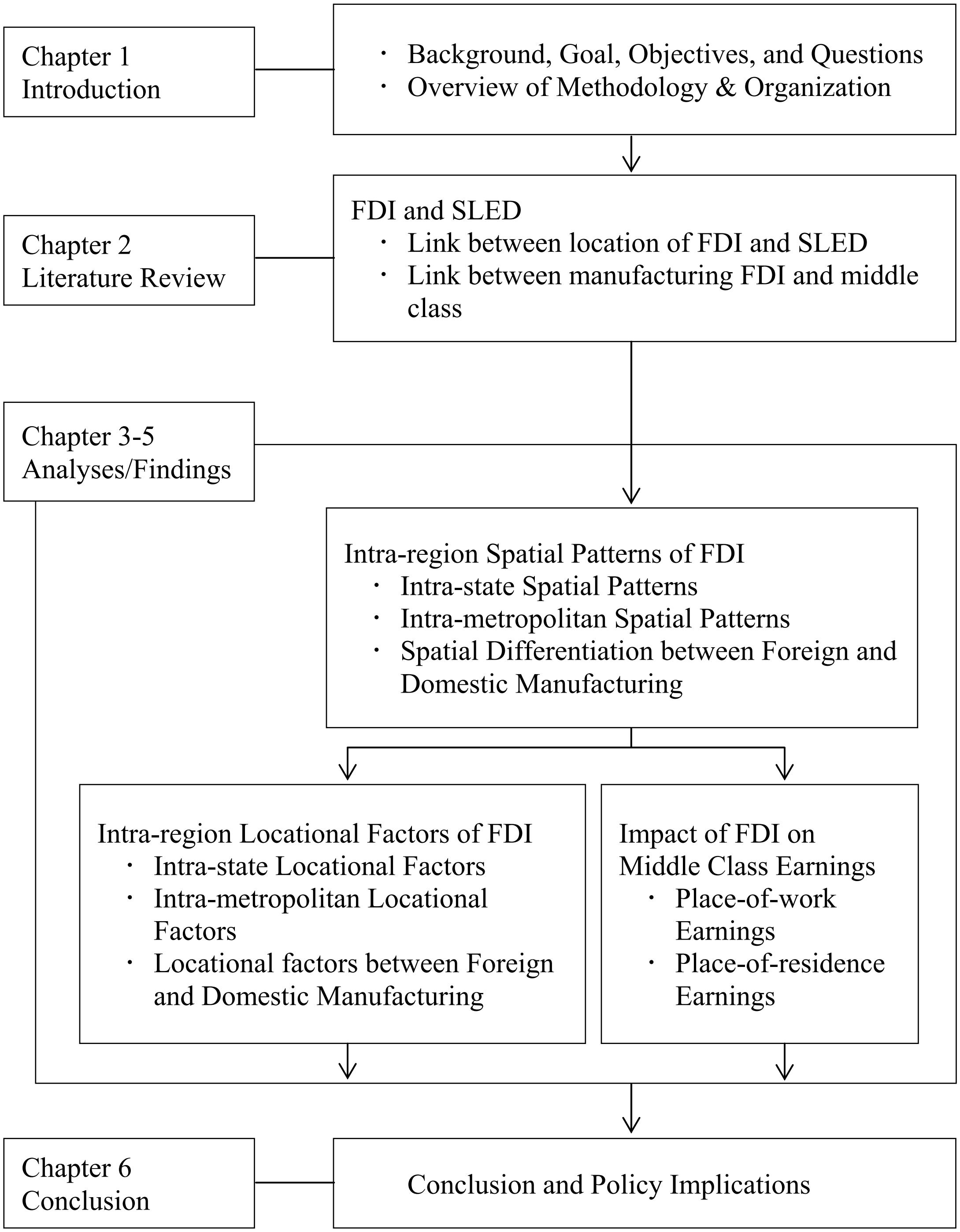

Figure 1.3. Research Organization

CHAPTER 2

LITERATURE REVIEW

2.1. Foreign Direct Investment

2.1.1. Definition and Trends of FDI

Definition of FDI

In the most basic terms, FDI is simply investment that spans international boundaries. However, different countries define it in different ways, and the definition has changed over time. The International Monetary Fund (2009) defines direct investment as "a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy"(p. 100). Similarly, the Organisation for Economic Co-Operation and Development (OECD, 2008) defines FDI as "a category of cross-border investment made by a resident in one economy (the direct investor) with the objective of establishing a lasting interest in an enterprise (the direct investment enterprise) that is resident in an economy other than that of the direct investor" (p. 17).

The United States, applies a narrower definition of FDI for data collection purposes. The criterion used to define direct investment is ownership or control of at least 10 percent of the voting securities of an incorporated business enterprise or an equivalent interest in an unincorporated business enterprise (U.S. Bureau of Economic Analysis, 2011). Thus, FDI in the United States (also called "inward direct investment") is "ownership or control, direct or indirect, by one foreign person of 10 percent or more of the voting securities of an incorporated U.S. business enterprise or an equivalent interest in an unincorporated U.S. business enterprise" (U.S. Bureau of Economic Analysis, 2011, p. 5).[1]

The U.S. defines any investment that falls short of the 10 percent threshold as a portfolio investment. The 10 percent criterion, although arbitrary, reflects the idea that the holder of a significant percentage of stock will generally have a strong say in the operations of a company even if that stockholder does not have a majority stake (Graham & Krugman, 1995). FDI is distinguishable from foreign portfolio investment in two essential ways. First, foreign portfolio investment does not entail control, or intent to control, a foreign company. Second, foreign portfolio investment also does not necessarily involve long-term investment (Head, 2007). This distinction is important in examining the motivations behind a company's decision to undertake FDI, as it is primarily a means to make money via increasing share prices or divided income.

[1] U.S. direct investment abroad (also called "outward direct investment") implies the ownership or control, directly or indirectly, by one U.S. resident (U.S. parent) of at least 10 percent of a foreign business enterprise (called a "foreign affiliate").

Trends of FDI in the U.S.

The United States is the world's largest recipient of FDI, and it has been an important factor in the U.S. economy for the past several decades. Figure 2.1 shows FDI has fluctuated with the U.S business cycle. Investment surged to a historical peak of $314 billion in 2000 and reached a similarly high level in 2008 with $306 billion. Despite the huge economic downturn beginning in 2008, the $130 billion in FDI recorded in 2009 was considerably higher than in the early 2000s, when it dropped below $100 billion in 2002 and 2003. In addition, FDI rebounded to $198 billion in 2010 and then to $227 billion in 2011.

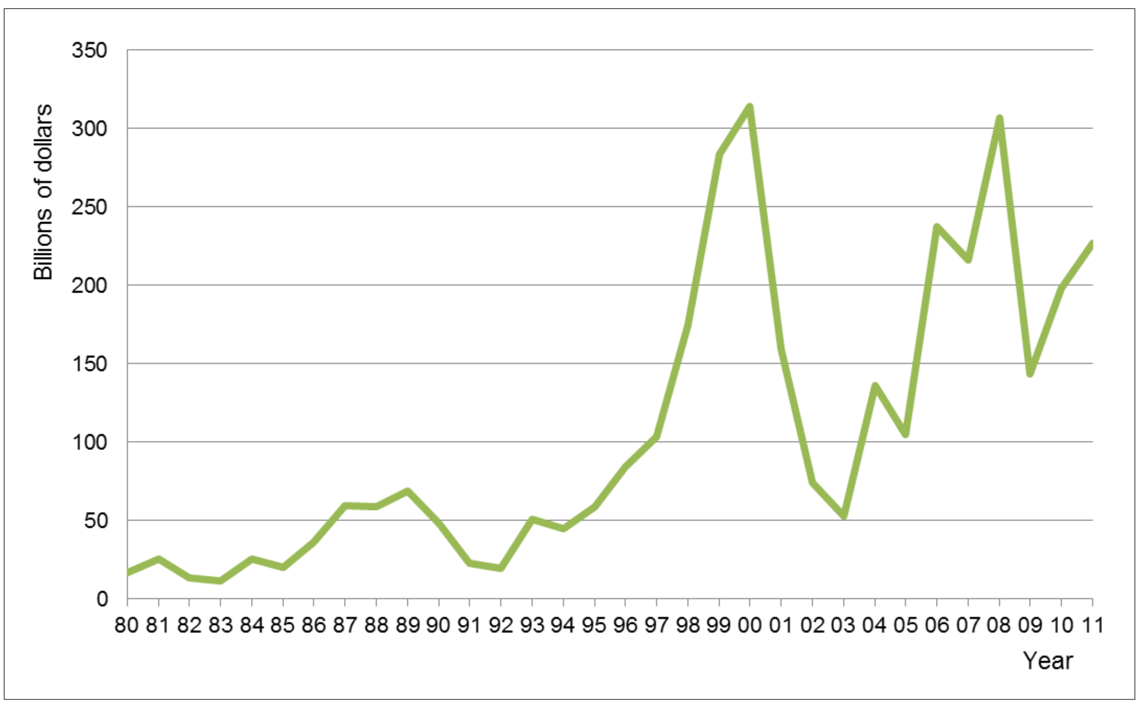

Figure 2.1. FDI in the U.S.: Financial Inflows without Current-Cost Adjustment
Source: U.S. Bureau of Economic Analysis.

FDI in the U.S. originates in a relatively small set of countries. In 2010, 66 percent of FDI inflow came from seven countries. Switzerland was the largest foreign investor in the U.S. in 2010, with $41 billion or 18 percent of total FDI (see Figure 2.2). Luxembourg was second, with about 28.7 billion in investment, or 12 percent of the total. Following Luxembourg, are Japan (9 percent), Germany (9 percent), France (8 percent), the Netherlands (5 percent), and Canada (5 percent).

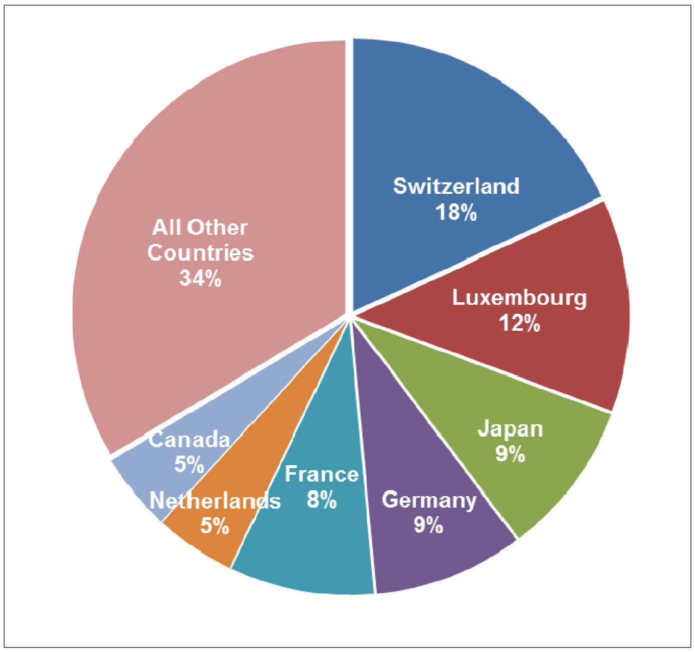

Figure 2.2. FDI Position in the U.S. by Country, 2010
Source: U.S. Bureau of Economic Analysis

FDI in the U.S. predominately occurs in the manufacturing sector. Figure 2.3 shows FDI in the U.S. economy by industry in 2010. Manufacturing was the leading sector, attracting $83.2 billion in investment, or 36 percent of total FDI. Another 14 percent of FDI occurred in the wholesale trade and retail sectors–reflecting purchases of department stores and other investments to assist foreign firms in marketing and distributing their products–and 13 percent occurred in the financial-related industries. Within the manufacturing sector, 39.5 percent of the $83.2 billion in manufacturing FDI was in the chemical sector ($32.8 billion), followed by 16.2 percent in the food sector ($13.4 billion) and 11.4 percent in the transportation equipment sector ($9.5 billion).

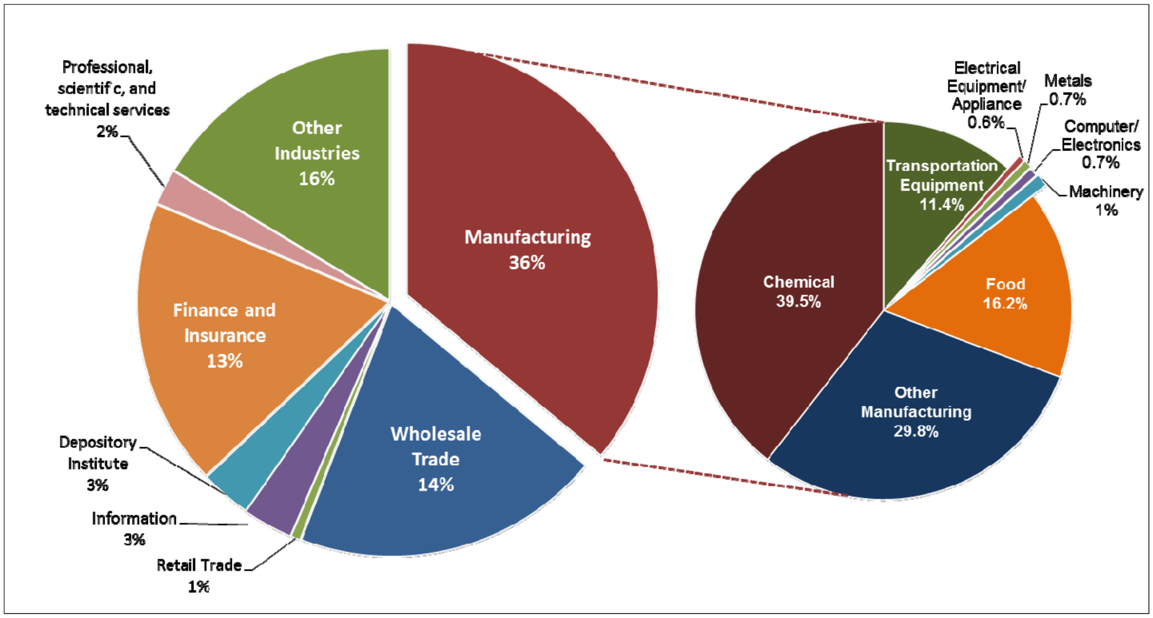

Figure 2.3. FDI by Industrial Sector, 2010
Source: U.S. Bureau of Economic Analysis

The majority-owned U.S. affiliates of foreign companies[2] have employed more than 5 million workers in the United States since 1996, and the employment by these companies has generally held steady over the last two decades. A significant portion of jobs offered by these companies has been in the manufacturing sector. Annual average manufacturing employment of 2.2 million accounted for 42.1 percent of total employment at majority-owned U.S. affiliates of foreign companies between 1990 and 2010. Total manufacturing jobs in the U.S. fell by 6.17 million, or 34 percent, from 1990 to 2010, while FDI-supported manufacturing jobs declined by only 234,000, or 11

[2] The U.S. Bureau of Economic Analysis defines “majority-owned U.S. affiliate” as a U.S. affiliate with more than 50 percent of its ownership in foreign parents.

percent. Thus, manufacturing FDI jobs tend to be more stable than domestic manufacturing jobs.

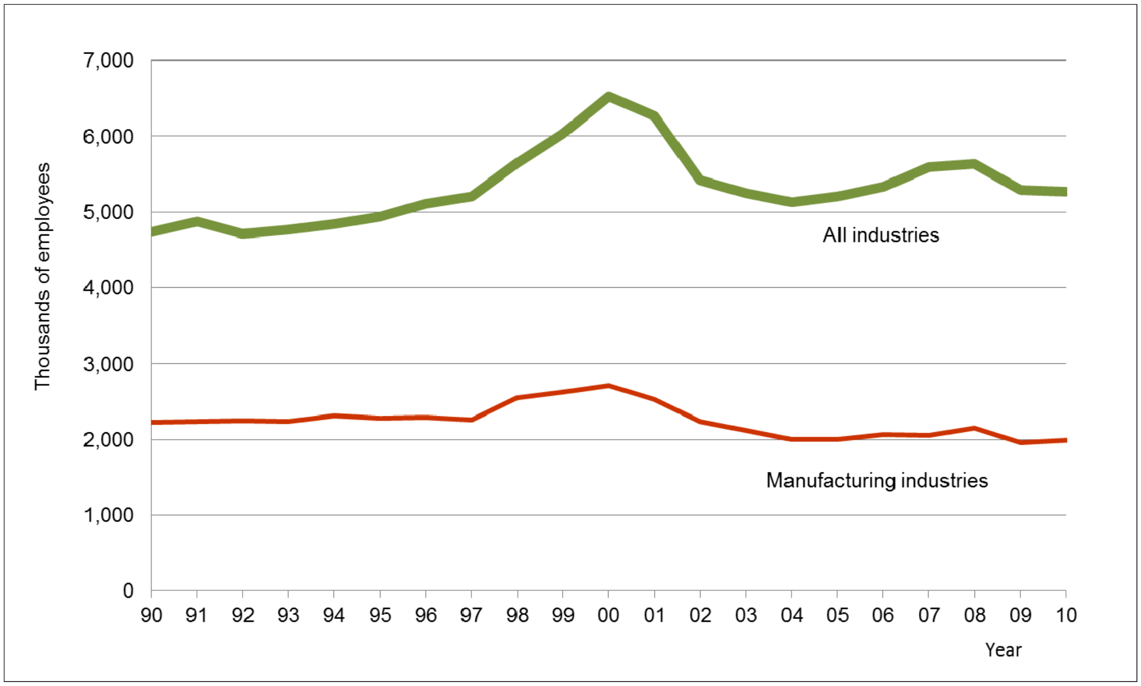

Figure 2.4. Employment by majority-owned U.S. affiliates of foreign firms
Source: U.S. Bureau of Economic Analysis

In 2010, manufacturing employment of 1.99 million accounted for 37.7 percent of total employment at majority-owned U.S. affiliates of foreign companies. In comparison, wholesale trade–the largest industry outside of manufacturing for employment by U.S. affiliates of foreign companies–employed 551,700 workers in 2010, followed by the retail trade (477,700 workers), the administration, support, and waste management industry (405,200 workers), and the finance and insurance industry (398,600 workers) (See Figure 2.5).

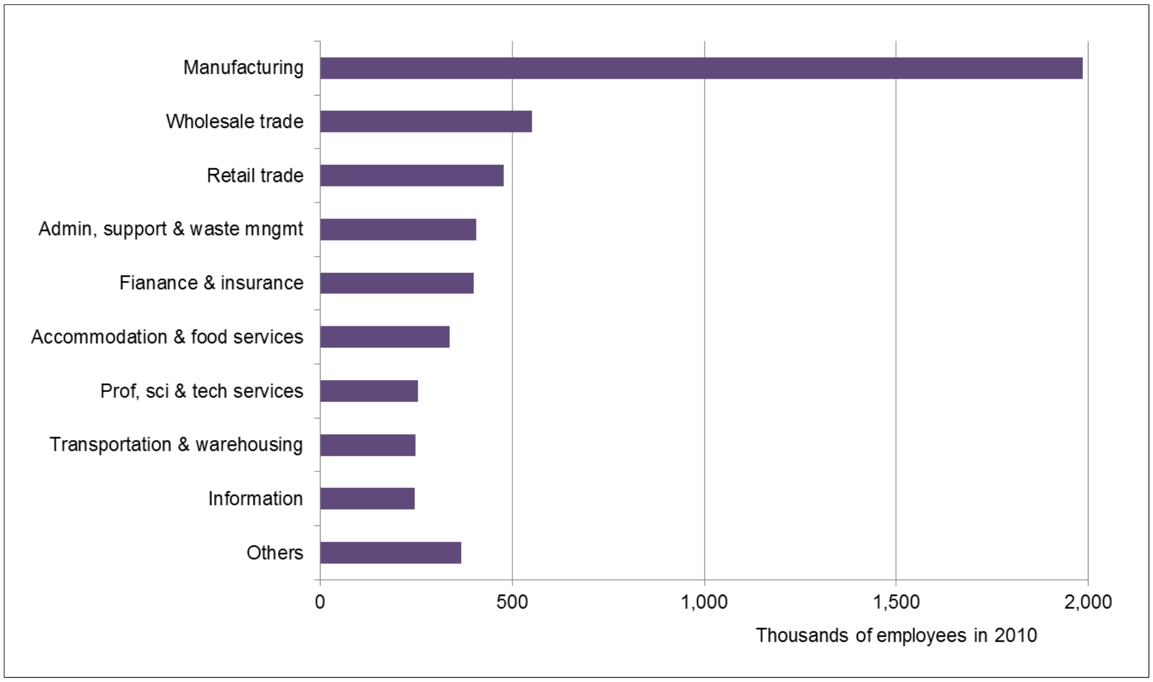

Figure 2.5. FDI Employment by Industry, 2010
Source: U.S. Bureau of Economic Analysis

2.1.2. Theories of FDI

FDI in a Globalization

Why do companies undertake direct investment abroad? Until the 1960s, FDI was modeled as a part of neoclassical trade theory, where markets operate efficiently, information is costless, and external economies of production and marketing exist, and exporting would be the mode of choice for foreign involvement. From the perspective of the neoclassical trade theory, capital moves from areas with low rates of return to areas with higher rates. Therefore, the theory treats FDI in the same way as any other cross-border transfer of capital.

However, FDI is more than just the transfer of capital, because it also involves the transfer of technology, as well as organizational and management skills (Jones & Wren, 2006). Stephen Hymer was the first to develop a view of FDI that went beyond the neoclassical trade theory. He attempted to explain the motivations behind FDI by focusing on the role of the firm and its organization (Hymer, 1979). Hymer couched these motivations in terms of market imperfections that placed barriers to entry, the removal of competition, and the exploitation of firm-specific advantages as the key factors in foreign-based production. Hymer's theory emphasized that the main motivation for firms to internationalize is to gain better access to foreign markets.

Despite Hymer's great contribution to FDI theory, his theory does not consider when and where the specific advantage of multinational cooperation would be exploited (Dunning, 1981). This determination was left to Raymond Vernon and his "product life cycle theory", which described the growth and decline of a given product (Ruigrok & Tulder, 1995). Based on a five-stage product life cycle, Vernon (1966) formulated an expansion and spatial growth trajectory of a firm by emphasizing the importance of technology change in the internationalization process (See Figure 2.6). In the first three stages of the product life cycle, firms tend to introduce new products in their home market. In the third stage, the firms also begin to establish overseas sales and representative offices. In the fourth stage, firms tend to set up plants overseas either to reduce production and distribution costs or to gain better access to foreign markets. If high tariff barriers protect these overseas markets, however, this shift of production might take place in the third stage. The theory emphasizes “the timing of innovation, the effects of scale economies, and the role of ignorance and uncertainty in influencing trade patterns” (Vernon, 1966, 1979).

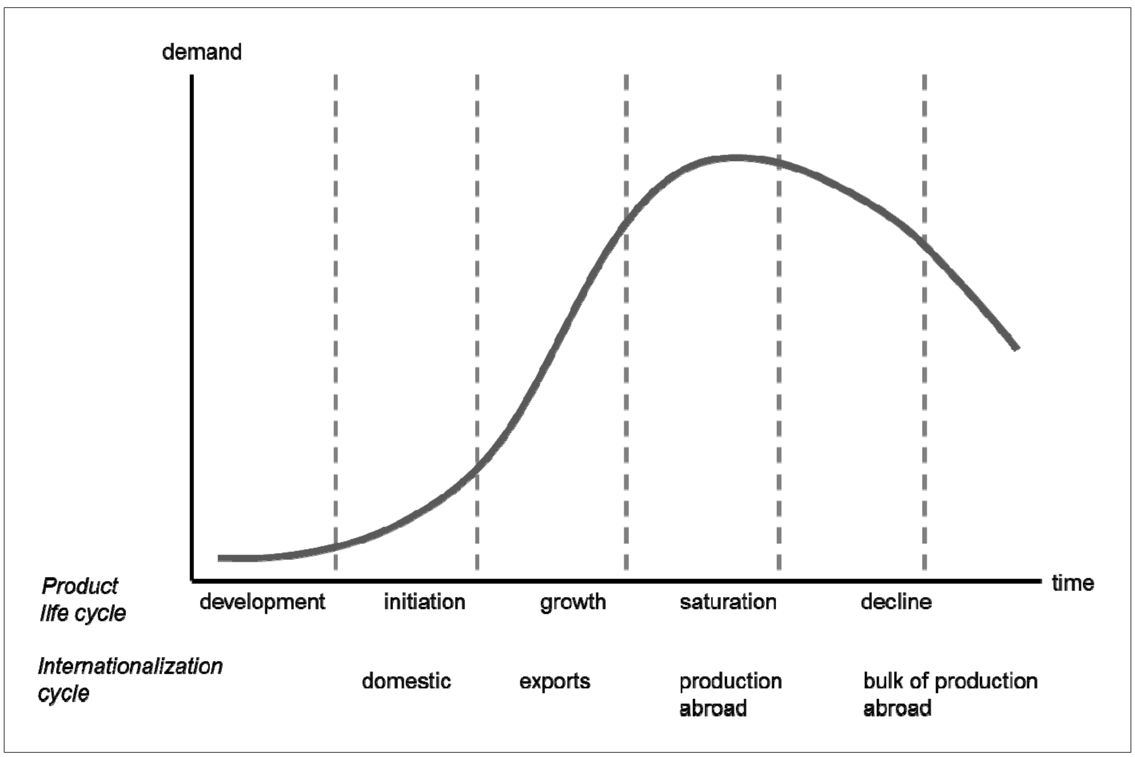

Figure 2.6. The product life cycle and the internationalization of the firm
Source: derived from Vernon (1966); Ruigrok & Tulder (1995)

Kenichi Ohmae (1987) provided another explanation of firm transformation through globalization. He distinguished five steps involving the transfer of activities in the business chain to a foreign location (Ohmae, 1987):

1. *Export.* The company performs the entire range of activity at home, with exports often handled by an exclusive local distributor.
2. *Direct sales and marketing*. If the foreign market favorably receives the product, the second step entails the establishment of a sales company overseas to provide better marketing sales and service functions to the customers.
3. *Direct product*. The third step involves the establishment of local production activities. The company has not yet integrated oversea sales and production; rather, these functions still report individually to headquarters.
4. *Full autonomy*. Companies transfer all activities of the business chain, including R&D, engineering, and financing to the key national market.
5. *Global integration*. In the ultimate stage of globalization, companies conduct their R&D and finance their cash requirements on a worldwide scale, and they recruit their personnel from all over the world.

John Dunning proposed the eclectic paradigm (or OLI approach), which attempted to understand why firms choose to engage in international production (Dunning, 1981, 1992). According to the eclectic paradigm, firms directly invest in a foreign country only if the investment fulfills three conditions. First, firms have ownership advantages, especially size advantage (or scale economies), in a product or a production process, allowing them better access to finance or technology that they can transfer between locations (O). Second, they look to exploit location-specific assets such as markets or resources (L). Finally, in the face of imperfect markets, firms choose to internalize (I) in order to reduce the uncertainties of international activity.

Table 2.1. Three conditions of the eclectic paradigm

Ownership (O)-specific advantages (internal to enterprises of one nationality)	
• Size of firm • Technology and trade marks • Management and organizational system • Access to spare capacity	• Economies of joint supply • Greater access to markets and knowledge • International opportunities such as diversifying risk
Location (L)-specific advantages (determining the location of production)	
• Distribution of inputs and markets • Costs of labor, materials and transport costs between countries	• Government intervention and policies • Commercial and legal infrastructure • Language, culture and custom (i.e. psychic distance)
Internalization (I)-specific advantages (overcoming market imperfections)	
• Reduction in search, negotiation and monitoring costs • Avoidance of property right enforcement costs	• Engage in price discrimination • Protection of product • Avoidance of tariffs

Source: derived from Dunning (1981)

Impact of FDI on Local Economy

As FDI has increased over time, a number of studies have examined its economic characteristics and its impact on local economies. Often viewed as an "engine of growth," FDI creates new jobs; boosts wages; brings in new research, technology, and skills; and increases tax bases (Dunning & Lundan, 2008; UNCTAD, 1992).

Job generation is one potential benefit to a local economy receiving FDI. U.S. subsidiaries of global companies directly and indirectly employed over 21 million American workers in 2009, which accounted for a significant share of the overall economy in 34 states, representing more than 10 percent of the total employment in each state (PWC, 2012). While mergers and acquisitions can save existing jobs through the purchase of an existing enterprise, greenfield investments–i.e., the creation of new enterprises and the development or expansion of production facilities or plants–can provide additional jobs in the communities where they are located (Shannon, Zeile, & Johnson, 1999). External investment in plants or facilities not only generates employment, but can also spur development of complementary businesses that provide further employment opportunities. Thus, attracting greenfield investment to localities and regions with high unemployment levels can be a desirable solution to their economic problems (OECD, 2008).

However, concern has arisen that the rapid rise in inward FDI may have an adverse effect on American workers. Some researchers feared that U.S. affiliates of foreign companies might change the composition of employment, moving "good" jobs to "bad" jobs with lower-than-average wages. Graham and Krugman (1995) compared compensation per employee and value added per employee across industries for U.S.

affiliates of foreign companies against U.S. companies with data for 1988 and 1990. Although aggregate data showed that both compensation and value added per worker were higher for foreign companies than for the average domestic company in the U.S., the difference between foreign and domestic companies was essentially due to differences in industrial composition. While employees in high-wage, capital-intensive industries such as petroleum refining and chemicals raise the average, no systematic difference existed between foreign- and U.S.-owned companies in compensation and value added per employee (Graham & Krugman, 1995).

Nevertheless, a recent study suggested that foreign companies pay higher wages than the average U.S.-owned plant (PWC, 2012). In 2009, for example, all jobs- related foreign companies (including direct, supply chain, and paycheck-spending-related jobs) averaged $58,500 in annual pay, which was approximately 17 percent higher than the average wage in U.S. domestic plants ($50,100). Wage differences increase when comparing average compensation per direct foreign affiliates to the U.S. average ($77,590 vs. $50,100). The total compensation associated with the direct- and indirect-foreign affiliates jobs accounted for $1.2 trillion in 2009, representing more than 10 percent of the total compensation in 42 states (PWC, 2012).

Another potential benefit of FDI is positive external economies that result from spillovers of new research, technology, and skills. If foreign plants are more technologically advanced than domestic plants, technological spillovers can result. Tangible examples exist to support the existence of such spillovers. For example, U.S. automakers have improved both product quality and manufacturing efficiency by employing the Japanese “just-in-time” supply system–in which suppliers brought components to the assembly line only when needed–and Japanese managerial methods (Brock, 2008; Ruigrok & Tulder, 1995). Doms and Jesen (1998) suggested foreign-owned plants are more technology intensive than the average U.S.-owned plant and, therefore, provide the possibility of more technology spillovers than the average U.S plants. Further, recent data indicates that U.S. majority-owned affiliates of foreign companies invested nearly $40.5 billion in research and development in 2008, accounting for 14.3 percent of total U.S. private R&D (Executive Office of the President, 2011).

Some studies argued that the long-term positive economic effects of FDI are less clear. These criticisms of FDI primarily focus on the possibility of lower quality jobs and the higher closure rate associated with the “footloose” nature of multinational cooperation (Graham & Krugman, 1995; Pavlínek, 2004). Moreover, an overreliance on FDI can lead to the emergence of “branch plant economies” that could become heavily dependent on decisions made by externally controlled firms (Massey, 1984). The problems of these “branch plant economies” could be that branch plants commonly provide unstable and unskilled employment and lack certain non-manufacturing functions, such as R&D, marketing, and certain decision-making responsibilities.

2.1.3. Location of FDI and State and Local Policies

Location Trends and Locational Factors of FDI

Most studies of FDI in the U.S. by individual country seek to identify reasons for investing in the U.S., rather than examining the location of FDI activities (Coughlin, 1998). Although researchers have made little attempt to identify FDI distribution patterns, some studies have attempted to explore how and why most FDIs are distributed unevenly among U.S. states.

Shannon et al. (1999) examined the regional distribution of employment for foreign-owned U.S. manufacturing establishments, with a particular emphasis on greenfield investments from 1987 to 1992. They found that the distribution of employment for manufacturing FDI was broadly similar to that for U.S. domestic plants, but foreign-owned establishments tended to locate more frequently in the Southeast. Further, foreign-owned companies tended to concentrate their U.S. greenfield establishments more heavily in parts of New England and the Southeast, in coastal Texas and Louisiana, and in Missouri and western Illinois.

Recent data from the U.S. Bureau of Economic Analysis also indicates a strong spatial concentration of FDI in certain regions (See Figure 2.7). Compared to other areas of the country, twelve southeastern states, including Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and Virginia, have been major beneficiaries of FDI. Measured by their employment figures between 1990 and 2010, activities by U.S. affiliates of foreign companies tended to be greatest in parts of the Southeast, the Mideast, the Great Lakes, and the Far West.

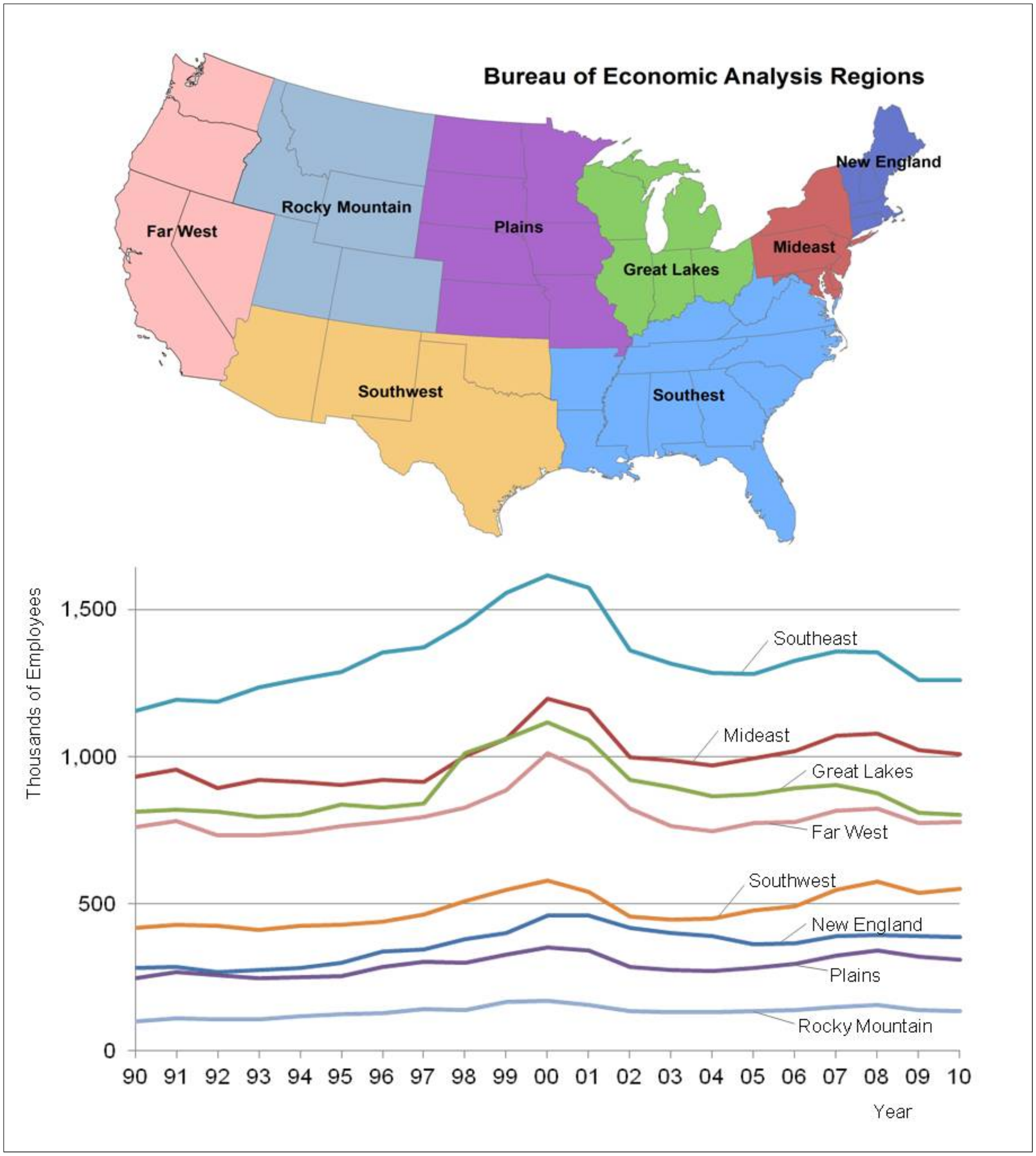

Figure 2.7. Employment by FDI by BEA Region, 1990-2010

Note: Total employment at majority-owned U.S. affiliates of foreign firms

Source: Author's calculations based on the data from the Bureau of Economic Analysis

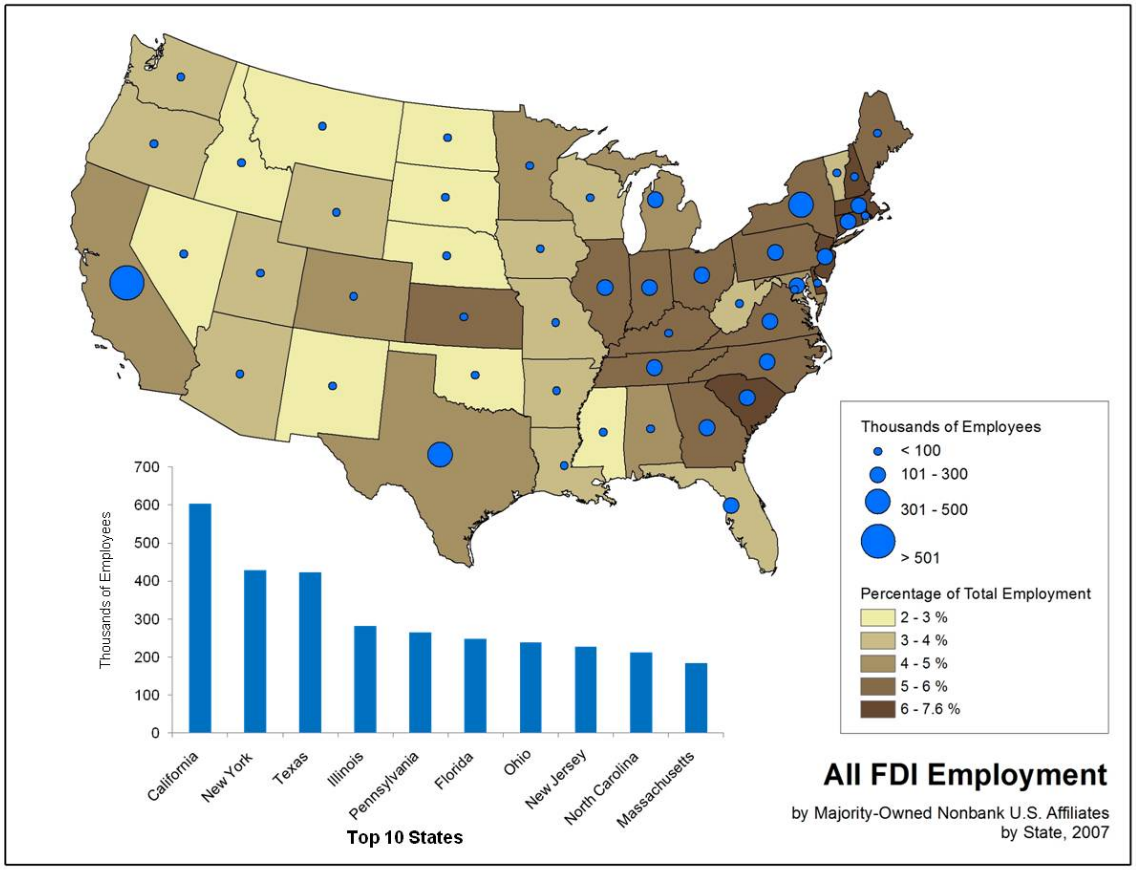

Figure 2.8. Location of FDI Employment across States, 2007
Source: Author's calculations based on the data from the Bureau of Economic Analysis

Figure 2.8 shows the distributions of FDI employment for the 48 contiguous U.S. states in 2007. With over six hundred thousand employees, California led the other states in FDI employment. New York and Texas had the second- and third- largest FDI employment with 429,300 and 422,600 employees, respectively. Following were Illinois (280,500), Pennsylvania (264,400), Florida (248,000), Ohio (238,200), New Jersey (227,400), North Carolina (211,000), and Massachusetts (183,700). Figure 2.8 also indicates the shares of FDI employment divided by total private industry employment for each state in 2007. The shares of FDI employment were highest in Delaware (7.6 percent), Connecticut (7.0 percent), South Carolina (6.9 percent), and New Hampshire (6.9 percent).

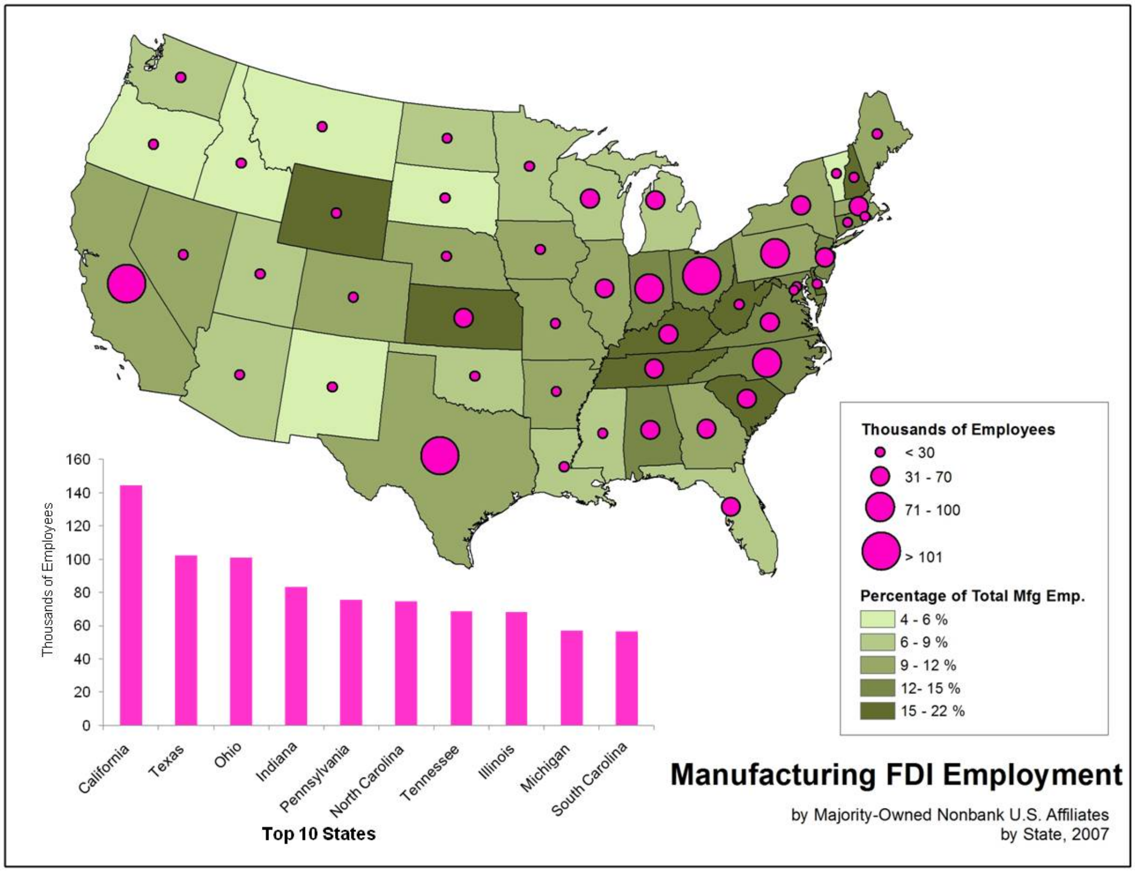

Figure 2.9. Location of Manufacturing FDI Employment across States, 2007
Source: Author's calculations based on the data from the Bureau of Economic Analysis

Figure 2.9 shows the distribution of manufacturing employment in the ten leading states, including California (144,400), Texas (102,400), Ohio (101,100), Indiana (83,100), Pennsylvania (75,600), North Carolina (74,500), Tennessee (68.6), Illinois (68,300), Michigan (57,000), and South Carolina (56,600). On the other hand, shares of manufacturing employment for foreign affiliates were highest in the Southeastern states of South Carolina (22.0 percent) and Kentucky (19.3). Other areas with relatively high affiliate shares of employment include New Hampshire (19.1 percent), the District of Columbia (18.9 percent), and Delaware (18.4 percent).

While most studies on the location of FDI in the United States have focused on the manufacturing sector, some studies emphasized specific industrial sectors. Klier and Rubenstein (2010) attempted to identify the geographic shifts in the U. S. auto industry, with a particular emphasis on the locational strategies of foreign-owned automakers. A key finding of their study is that foreign-owned makers tended to site their assembly plants away from the Midwest manufacturing locations favored by Detroit automakers had to sites further south. In the early stages of the auto industry, the logic of location was “one international assembly plant per state”, because the international automakers were reluctant to compete with each other for qualified workers, subsidies, tax incentives, and training programs. In the early 2000s, however, the foreign automakers had no choice but to look for sites in states already occupied by other international manufacturers. The locational pattern shifted to siting new assembly plants within two hours distance from existing plants to avoid competition for the same workforce (Klier & Rubenstein, 2010).

Regional patterns in the location of FDI across different areas raise questions regarding what factors influence foreign investment decisions. A well-developed body of literature related to this subject has identified several locational factors: proximity to markets, labor market conditions, land availability, transportation and infrastructure, taxes and government promotion, agglomeration economies, quality of life, race and poverty density, and so on (Coughlin & Segev, 2000; Coughlin, Terza, & Arromdee, 1991; J. Friedman, Gerlowski, & Silberman, 1992; Head, Ries, & Swenson, 1999; Kandogan, 2012; Kim, Pickton, & Gerking, 2003; Smith & Florida, 1994; Woodward, 1992). The literature on the locational factors provides generally similar findings despite some contrasting results. The size of a state's market, agglomeration economies, skilled labor force and productivity, access to transportation, and government incentives and promotional efforts are positively related to FDI, while higher wage rates, unionization, and state and local taxes deter FDI (Coughlin & Segev, 2000; Coughlin et al., 1991; J. Friedman et al., 1992; Head et al., 1999; Kandogan, 2012; Kim et al., 2003; Smith & Florida, 1994; Woodward, 1992).[3]

Local and State Policies on FDI

Policies to attract FDI have become standard in most local and state governments. Individual states and localities compete against each other for investments on a global scale by providing investment incentives. These incentives take various forms, including outright subsidies, various forms of tax abatement, provision of land free of charge, provision of infrastructure free of charge, job training, and housing assistance.

Many local and state economic development agencies also employ highly skilled investment officials and, in some cases, maintain their international offices worldwide directly to promote FDI to their areas. Not all, but many, states have an international economic development office as a subdivision of the state's economic development agency. In some states, the international office is in the same location as the economic development agency. In many other cases, the international offices are located around the

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[3] For detailed results of the previous studies related to the locations of FDI, see discussion on variables for intra-region locational factors of FDI (4.1.1. Intra-state Locational Factors Models in the following Chapter 4, and Table 4.1and Table 4.2).

world. The number of the international office has increased over the past 20 years. While states maintained only 56 international offices abroad in 1984, by 1994, just 10 years later, 162 state offices existed (Conlan & Sager, 2001). The locational pattern of these offices has changed over time, reflecting changes in the world economy. While most states originally focused their international offices in Europe, many states had shifted or expanded their emphasis to East Asia by the mid-1990s, targeting Japan in particular (Conlan & Sager, 2001).

An important question arises as to why state and local governments directly compete with one another for outside investments. According to Markusen (2007), two important institutional changes have contributed to this competition: the rise of site consultants and the increasing devolution of economic development responsibilities from central to subnational governments. As transport and communication costs have declined, business activities can be sited at a wider variety of locations, making local costs such as wages and taxes more important factors in the location decision (Bartik, 2007). While firms are now more likely to claim that taxes matter, coordination among direct investors also exists through the operation of site location consultants (Markusen, 2007). These firms work to extract greater concessions in negotiations over individual projects, but they also attempt to foster an atmosphere in which governments support the creation of the necessary incentives to be competitive for investment projects (Fisher, 2007; Thomas, 2007).

Another institutional change is devolution of economic development responsibilities from central to subnational governments (Markusen & Glasmeier, 2008). Since the Second World War, the U.S. Government has always played a key role in ensuring regional and local development, often reflecting a commitment to limit the growth of inter-regional disparities and promote the development of rural areas. However, the federal government has slowly backed away from this role, relegating responsibility for economic development to state and local governments. In many cases, however, state and local governments lack adequate resources, revenue-raising powers, highly skilled investment expertise, or the necessary experience to bargain with multinational corporations and their site location consultants (Llanes, 1998). Therefore, the devolution from central government participation may push more state and local governments to compete against each other to attract investments (Markusen & Glasmeier, 2008).

When the ultimate goal of economic development practice is to a build a sustainable local economy with equity and environmental quality norms co-equal with economic efficiency (Fitzgerald & Leigh, 2002), Thomas (2007) also emphasized that localized economic incentives can have potential drawbacks in the areas of efficiency, equity, and the environment. With regard to efficiency, incentives may induce firms to choose inefficient locations or to continue inefficient production, and they may harm other efficient unsubsidized competitors. In terms of equity, incentives may worsen income distributions. The primary environmental concern is the potentially negative impacts on environment, such as building in a floodplain.

Therefore, a number of authors have suggested alternative policies. Some have proposed that it would make sense for the U.S. government to ban state investment incentives to foreign investors and that the states themselves would be better off under such a ban (Glickman & Woodward, 1989; Graham & Krugman, 1995). However, Bartik (2007) argued that federal intervention in incentive policy would make things worse because the federal government has less knowledge about local situations and a reduced responsibility to local needs. Rather, he emphasized broader public participation and debate to reform the incentive policy process.

Young and Hood (1995) suggested more proactive policies targeting investment that can contribute towards the broader objectives of local and regional development and assessment of the quality of investment projects (e.g. type of jobs, occupations, functions or supply chains). In addition, local and regional agencies can consider integration of inward investment and broader local and regional development programs, connecting exogenous and indigenous approaches (Pike, Rodriquez-Pose, & Tomaney, 2006; Young & Hood, 1995). Exogenous strategies have the potential to connect to indigenous approaches. For example, some economic development authorities have used explicit linkage programs to exploit market opportunities for the supply of goods and services from local and regional businesses to inward investment plants. These strategies can encompass supply chain initiatives by local and regional agencies focused on technology, skills and training, and management (Pike et al., 2006).

While most current local and regional economic development practices have focused on attracting outside firms, Markusen (2004) provided an alternative approach that focuses more on attracting particular types of workers. In the face of accelerating capital mobility and waxing incentive wars among regions and cities, Markusen's approach, emphasizing human capital and investment in skills and training, becomes more attractive. Florida (2002a, 2002b) also suggested that the future of local economies relies on attracting and retaining members of the "creative class," comprised of those who work in sectors such as technology, media and entertainment, and finance and whose activities embody creativity, individuality and difference. These approaches believe that skilled labor is the key engine of regional economy because it increases the productivity and performance of a range of firms and industries.

2.2. Manufacturing and the Middle Class

2.2.1. Importance of Manufacturing

During the past decades, the makeup of the American economy has changed dramatically. For the first half of the last century, one third of all Americans were employed in manufacturing, which constituted about 35 percent of the nation's GDP and never dipped below 21 percent until 1980 (Hindery, 2009). However, the last three decades witnessed huge declines in U. S. manufacturing. Manufacturing sector employment dropped to just 8 percent of the American labor force and 11.5 percent of the GDP in 2009, representing a loss of 41 percent since 1979.

Debate continues over whether "manufacturing matters" to the American economy. One group claimed that job loss in the manufacturing sector is unavoidable and thus should not be a public concern. They argued that several reasons exist for the inevitable decline of American manufacturing, including rapid productivity growth, the impossibility of competing with countries with lower wages, and the process of economic restructuring to high-tech services and knowledge-based economies (Bhagwati, 2010; T. L. Friedman, 2005; Worstall, 2012). Others argued that manufacturing remains a leading sector with a much larger share of employment, higher wages, and a greater proportion of tax revenues than other industries (Doron, August 2010; Helper, 2008; Helper et al., 2012b; Hindery, 2009; McCormack, 2009).

Recent literature has identified several reasons why American manufacturing is crucial to the U.S. economy. First, manufacturing is an important job creator. Despite the huge decline in the manufacturing sector, it still maintains a substantial share of the national employment. The sector directly employs almost 12 million people, which amounted to about 10 percent of total employment in 2012. Further, the manufacturing sector is beginning to show some positive signs of recovery (Helper et al., 2012b). During the past three years, the industry added more than 300,000 jobs–even after the financial crisis of 2008–representing the first positive uptick in manufacturing employment.

Because of the multiplier effects of a manufacturing firm the placement of a new plant in a particular region, results in a number of new jobs, both directly from the firm and from local service providers, as well as new workforce needs, housing, and community development. For example, a strong automotive industry has historically supported the growth and stability of many other industries. The Center for Automotive Research (2010) estimated that every new job in auto manufacturing creates nine jobs outside the factory, from parts makers to restaurant workers. As another example, 15 additional jobs arise for every single job in computer manufacturing operations in California (DeVol, Wong, Bedroussian, Hynek, & Rice, 2009).

Second, manufacturing offers higher wages and employee benefits, compared to non-manufacturing industries (Helper et al., 2012b). From 2008 to 2010, average weekly earnings for manufacturing jobs on average were 19.9 percent higher than for non-manufacturing jobs ($943.06 vs. $786.40). These higher earnings are especially important for women and people of color, who might otherwise earn the lowest wages (Hindery, 2009; Leigh, 1994). Further, workers in manufacturing are more likely to expect some of the most common employee benefits, including retirement plans, defined benefit plans, defined contribution plans, paid holiday or vacation, life insurance, medical care, and so on (Helper et al., 2012b).

Third, manufacturing is a major source of innovation. Manufacturers are the largest investors in research and development, sharing 68 percent of U.S. domestic company R&D spending between 2006 and 2008 (Helper et al., 2012b). Because engineers play critical roles in technological innovation, the manufacturing sector in 2010 employed 35.2 percent of all engineers, compared with only 8.9 percent of all workers. Manufacturing also is particularly important in dealing with the rising concerns about global warming, because this sector has the capability to create and use "green technology" for producing energy from renewable sources such as solar, wind, geothermal heat, and biomass. Manufacturing can also provide energy-efficient equipment and expertise in reducing greenhouse gas emissions (Helper, 2008).

Finally, manufacturing has a huge impact on the middle class. It has historically been a primary source for middle class jobs, characterized by decent wages and benefits, especially for workers without a college degree. About 48 percent of manufacturing workers have no formal education beyond high school, compared with only 37 percent of non-manufacturing workers (Helper et al., 2012b). In this era of de-industrialization, plant closings and layoffs in manufacturing have weakened those American middle class communities that depended on factories (Bluestone & Harrison, 1982). Disappearing manufacturing jobs are associated with the proliferation of low-wage, no-benefits jobs that do not meet the need for a minimum standard of living (Leigh, 1994).

Recently, a variety of efforts to restore manufacturing have been made. Commentators increasingly agree that the United States cannot thrive on its service sector alone. Rather, reinventing manufacturing presents a way to ensure U.S. competitiveness, to feed into the Nation's innovation economy, and to reinvigorate the domestic manufacturing base (U.S. President's Council of Advisors on Science and Technology, 2012). In 2011, President Obama launched the Advanced Manufacturing Partnership: a group of industry, academic, and government representatives charged with finding a way to make strategic investments in the development of emerging technologies as a method of creating high-quality manufacturing jobs and enhancing U.S. global competitiveness (The White House, June 24, 2011).

Additionally, in February 2013, the Obama administration proposed four concrete agendas to revitalize American manufacturing. These proposals include: creating a network of 15 new Manufacturing Innovation Institutes; ending tax breaks to industries shipping jobs overseas, thus making the U.S. more competitive; building new partnerships with communities to attract manufacturers and their suppliers, especially to hard hit manufacturing areas; and pursuing a dual effort to both open new markets for American-made goods and to strengthen the Interagency Trade Enforcement Center, launched in 2012 (The White House, February 13, 2013).

A number of commitments also exist at the metropolitan level to revitalize American manufacturing, including initiatives that are planned or already underway. For example, metropolitan Chicago is a leader in developing creative manufacturing policies. Founded in 2005, the Chicago Manufacturing Renaissance Council is a unique public-private partnership that addresses the current regional manufacturing challenge: to spur a more productive, more innovative, and growing manufacturing sector as a contributor to a strong metropolitan economy (Wial, 2013).

2.2.2. Challenges and Opportunities in Manufacturing Location

Despite long-term job losses, American manufacturing remains a critical part of the economic base in most metropolitan areas. Government policy and planning for the revitalization of manufacturing now takes a variety of forms. Among these are special tax breaks and support for manufacturing industries, the training of workers for high-tech manufacturing jobs, and advocacy for trade restrictions or direct government investment in promising industries. In the context of these efforts, a consideration of the location manufacturing facilities becomes important.

Historically, metropolitan areas and central cities contained therein have been core locations for the great majority of manufacturing employment, but this employment has shifted dramatically away from central cities and metropolitan areas during the past several decades. In their empirical analysis of employment and worker redistribution patterns in 10 metropolitan areas over the period from 1940-1970, Stanback and Knight (1976) found that the geographic composition of manufacturing jobs had continued to shift from central cities to suburbs. The cities experienced a rapid decline in their manufacturing jobs while business services tended to expand in the central location. Meanwhile, suburban areas acquired the high value-added manufacturing jobs.

The trend of suburbanization of manufacturing jobs continued in the 1980s, 1990s, and into the first decade of the 21st century. Helper et al. (2012a) examined the suburbanization (or decentralization) patterns of manufacturing employment between 1980 and 2010 with county-level data. During the 1980s and 1990s, the central counties of metropolitan areas with three or more counties lost manufacturing jobs, while the outlying counties of those metropolitan areas gained them. Between 2000 and 2010, central counties lost manufacturing jobs at a faster rate than outlying counties. Central counties lost 33.9 percent of their manufacturing jobs while outlying counties lost only 29.3 percent (Helper et al., 2012a).

Kneebone (2009) reported similar findings in her job sprawl analysis of 98 of the largest metropolitan areas between 1998 and 2006. During this period of economic growth, recession, and recovery, jobs in almost every major industry shifted away from the city center. Manufacturing employment also decentralized, but the patterns occurred in a very different context. Within each metropolitan ring, manufacturing experienced overall net decreases in jobs, and manufacturing jobs continued to decentralize since job declines in the urban core outpaced those in the outer ring (Kneebone, 2009).

The study in Helper et al. (2012a) found long-term exurbanization patterns in manufacturing employment. During the 1980s and 1990s, the 100 largest metropolitan areas lost manufacturing jobs more rapidly than smaller metropolitan and non-metropolitan areas. In particular, the smaller metropolitan and non-metropolitan areas gained manufacturing jobs while the largest metropolitan areas lost them. A temporary pause in the exurbanization of manufacturing jobs occurred in the 2010s, when the largest metropolitan areas lost jobs at a slower rate than non-metropolitan areas. However, the level of manufacturing job growth in non-metropolitan counties exceeded that of metropolitan areas between 2010 and 2011 (Helper et al., 2012a).

Some studies have identified the factors associated with the suburbanization and exurbanization of manufacturing employment. Frey and Speare (1988) linked the context of suburbanization of manufacturing to industrial restructuring that was decidedly more service-oriented in the 1970s and less dependent on labor-intensive manufacturing.

Recent studies on the challenges faced by urban manufacturing locations focused on industrial land availability and quality, as well as environmental contamination in central cities (Fitzgerald & Leigh, 2002; Leigh & Hoelzel, 2012; Mistry & Byron, 2011). Availability, affordability, and quality of land and building are important considerations for manufacturers in choosing their locations. However, difficulties in acquiring, developing, and maintaining tenure on suitable urban industrial land present considerable challenges in most central cities and metropolitan areas. During the boom of the urban revitalization in the 1990s and the early 2000s, many central cities lost industrial land to other uses. Because of cities' fiscal needs and aspirations to higher property taxes, strong pressures arose to encourage the conversion of industrial land to other uses. (Mistry & Byron, 2011).

San Francisco, for instance, has rezoned nearly half of its industrial land, mostly to mixed-use development to attract new residents, since the 1990s (Leigh et al., 2009). New York City also lost over 20 percent of the 12,542 acres of the city's industrial land to other uses between 2002 and 2010. The city redeveloped its industrial waterfronts in Brooklyn and Queens to high-rise residential and office towers, along with retail shops and amenities, to accommodate growing demand for residential and office space (Mistry & Byron, 2011). In response to this situation, Leigh and Hoelzel (2012) argued that current initiatives of smart growth fail to ensure coordination with economic development concerns, resulting in the decentralization of employment and a significant loss of office and industrial properties in the central city.

Urban lands contaminated by past manufacturing uses–especially by heavy industrial facilities such as steel mills, chemical facilities, and other types of processing plants–are a challenge in locating new manufacturing in the central cities. Because the landowner has responsibility for investigation and remediation of these properties, most manufacturers prefer greenfield sites in suburban or rural areas. Some state and local governments, including New Jersey, New York and Pennsylvania, have adopted use-based cleanup standards for brownfield sites, intended to ease the burden on industrial land owners' and users' clean-up costs. Even with these initiatives, however, many urban industrial lands in central cities remain unattractive for manufacturing users because suburban or rural manufacturers can build and expand on greenfield sites with relatively lower development costs (Mistry & Byron, 2011).

Despite these challenges in urban manufacturing location, central cities and metropolitan areas can present numerous locational benefits to manufacturers. These benefits are associated with positive external economies or agglomeration economies (Glaeser, Kallal, Scheinkman, & Shleifer, 1992; Hoover, 1937; Jacobs, 1969; Krugman, 1993; Marshall, [1860] 1961). Agglomeration economies typically can provide production-cost savings through the close location of firms to one another. Manufacturing firms tend to cluster to take advantage of the positive externalities generated by proximity within central cities or metropolitan areas. By selecting locations near each other, firms receive access to specialized input suppliers and customers, a shared pooled market for skilled labor, and technological spillovers through the facilitation of information exchange.

Central cities and metropolitan areas are still desirable locations for manufacturers in other ways as well. The boom in downtown residential development and revitalization efforts to make downtowns "live and work" spaces for professionals or high-skilled workers make it advantageous for high-tech or advanced manufacturing firms to find accommodating industrial properties in more centrally situated, central city or metropolitan area locations. (Fitzgerald & Leigh, 2002).

The adoption of flexible technologies, such as just-in-time (JIT) production systems, with accompanying trends toward adjoining warehousing and distribution systems, have led to existing central city industrial facilities that tend to have smaller footprints and multiple stories (Fitzgerald & Leigh, 2002; Leigh, 1996). Some nonprofit developers in central cities–such as Greenpoint Manufacturing and Design Center in Brooklyn, New York–have adopted customized retrofits and installations to accommodate low-inventory/JIT production systems. In another example, large corporations–such as the Allen-Bradley Corporation in Milwaukee–adopted smaller, compartmentalized factories within multi-story sites (Fitzgerald & Leigh, 2002).

In response to the suburbanization and exurbanization patterns of manufacturing employment over several decades, many cities have been initiating industrial retention strategies for keeping manufacturing strong in central cities and metropolitan areas. In 1988, for instance, Chicago created the first Planned Manufacturing District (PMD) to preserve industrial assets in the face of pressure from competing land uses, specifically residential and commercial, along Clybourn Avenue (LEED Council, 2008). In the 1980s, the old industrial areas lost a great number of firms and significant employment: half of the industrial firms (600) were displaced and employment fell from 40,000 to 20,000 (ICIC, 2013). A strategy for preventing industrial site loss in the inner city was critical in terms of job security and impacts on surrounding communities.

The Local Employment and Economic Development (LEED) Council, an economic development arm of the local YMCA, found in their study that 75 percent of industrial workers lived in the city and half of these workers lived within three miles of a plant's location. The study further revealed that these jobs were "head of household" jobs, offering competitive wages and benefits, and thus the displacement of manufacturing plants had a significant, direct impact on nearby communities (ICIC, 2013). The PMD has served as a powerful zoning tool for maintaining affordable industrial land in order to retain Chicago's employment base. After the creation of the first PMD in the Clybourn corridor, the Elston and Goose Island PMDs followed in 1991, and the Chicago-Halsted PMD in 1998. Chicago now has 15 PMDs in its various industrial corridors.

These industrial retention strategies involving land use planning are quite successful. The Goose Island PMD, for example, had 25 plants employing 1,000 workers in 1991, but the PMD has seen significant firm and job growth, with 100 firms and about 5,000 jobs by 2012 (ICIC, 2013). Moreover, firms in the PMDs were more like to invest in their locations and expand because the PMDs ensure that industry will not face undue competition from residential and commercial uses. Other cities nationwide have developed a land use designation similar to the PMDs, including Portland's land use designation and Seattle's manufacturing-industrial centers (MICs), as part of their comprehensive growth management plan (Fitzgerald & Leigh, 2002).

Brownfield redevelopment has been a major focus of economic development efforts. The advantages in redeveloping brownfield properties include cleaning up environmental contamination, returning abandoned properties to the tax base, retaining or creating new jobs, increasing neighborhood economic vitality, and discouraging urban sprawl and loss of greenfield (Fitzgerald & Leigh, 2002). However, redeveloping brownfield sites, often previously used as industrial sites, for nonindustrial end uses may require cities to spend more to provide basic public services than the tax revenue collected from such uses (Leigh & Hoelzel, 2012). Thus, brownfield development for new industrial activity in central cities is an important strategy that strengthens the economic base and secures jobs for inner city communities.

2.2.3. Middle Class and Manufacturing Jobs

The middle class represents the icon of the American Dream, and historically, achieving middle class status amounted to the attainment of that dream. The middle class standard of living is also a benchmark by which economic development progress is measured (Leigh, 1994). Since the 1980s, therefore, debate has continued over whether the American middle class is shrinking as a measure of the strength of the U.S. economy and the health of American society (Bluestone & Harrison, 1982).

Numerous researchers have documented that a portion of the American middle class has declined significantly, and economic inequality has increased, over the past several decades (Autor, Katz, & Kearney, 2005; Booza, Galster, & Cutsinger, 2006; Gottschalk, 1997; Leigh, 1994; Reardon & Bischoff, 2011; White House Task Force on the Middle Class, 2010). Using census data and American Community Survey (ACS) data, Reardon and Bischoff (2011) examined family income at the neighborhood level in the country's 117 biggest metropolitan areas. Their findings showed a steady decline in the proportion of families in middle class neighborhoods between 1970 and 2007, and a corresponding increase in the number of families in affluent and poor neighborhoods. Sixty five percent of families lived in middle-income neighborhoods in 1970, but only 44 percent of families lived in such neighborhoods by 2007. The proportion of families living in affluent and poor neighborhoods doubled from seven to 14 percent and 8 to 17 percent, respectively, over the same period.

The report of the White House Task Force on the Middle Class (2010) examined the economic origins of the middle class squeeze. From 1947 to 1979, no big difference existed in the annual growth rate between U.S. productivity and middle class income: 2.5

percent and 2.4 percent, respectively. After 1979, however, this trend decelerated significantly. While the productivity has continued to grow with a 2.0 percent annual rate between 1979 and 2007, middle class income grew only 0.4 percent per year. This means the gap between economic output and middle class income growth has greatly increased since 1979. In other words, the middle class is no longer getting its share of economic growth even though productivity has continued to grow robustly (White House Task Force on the Middle Class, 2010).

Researchers have proposed several explanations for the decline of the American middle class. The early demographic explanation argued that this decline and the corresponding growth in the low earning sector were related to the entrance of the baby boom generation into the labor force (Lawrence, 1984; Leigh, 1994). By emphasizing that a worker's age correlated with higher earnings, the life-cycle model also explained that the decline of the middle class was due to the baby boomer cohort entering the labor force, but it found that the trend was temporary and would disappear as the baby boomers aged (Leigh, 1994; Linden, January 23, 1984). Industrial restructuring or deindustrialization could also explain the shrinking middle class. Industrial restructuring from smokestack industries to high-tech and/or from goods-producing industries to service-producing industries may result in the displacement of high-paying jobs for low-paying ones (Bluestone & Harrison, 1982; Rosenthal, 1985).

As previously emphasized, manufacturing has a huge impact on the middle class. U.S. government initiatives on protecting middle class jobs focus on a strong manufacturing sector to achieve good middle class jobs (White House Task Force on the Middle Class, 2010). Back in February 2013, President Obama stressed the importance of a strong manufacturing sector to solve the middle class squeeze and to build a stable middle class:

> I've been…talking about the important task I laid out in my State of the Union Address: reigniting the true engine of America's economic growth–a rising, thriving middle class… I believe all that starts by making America a magnet for new jobs and manufacturing. After shedding jobs for more than 10 years, our manufacturers have added about 500,000 jobs over the past three. What we need to do now is simple. We need to accelerate that trend. (Obama, February 16, 2013)

Although it is a commonly held belief that manufacturing has historically been a primary source of middle class jobs characterized by decent wages and benefits, especially for workers without a college degree, recent analysis suggests this precept may reflect a misconception about manufacturing. Over half of current manufacturing workers have some education beyond high school, up from just over 20 percent in 1969. Because today, production is capital-intensive and technologically sophisticated, educational requirements have risen, resulting in higher manufacturing wages (U.S. Executive Office of the President, 2009). Therefore, support of manufacturing is essential both for those individuals seeking to obtain an affordable standard-of-living and for the positive macroeconomic benefits that result from an increase in middle class employment.

2.3. Sustainable Local Economic Development

2.3.1. Concept of Sustainable Local Economic Development

Since the term "sustainable development" emerged from the 1987 report of the United Nations World Commission on Environment and Development (WCED) entitled *Our Common Future*, diverse approaches have arisen to achieve sustainability in the formulation of a generation of international, national, state, regional and local plans and programs. The report defined the concept that sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 43).

Thus, sustainable development requires the integration of three goals (economic growth, environmental protection, and social equity) into all public policy and planning. Scott Campbell (1966), in his triangular model of planning for sustainability, illustrated that three primary contradictions exist among these goals of sustainable development: the property conflict, the resource conflict, and the development conflict. This model illustrated that if planners pay narrow attention to a single conflict, they will miss a range of other conflicts, and the resulting development plan would be neither comprehensive nor supportive of the public interest. Therefore, he argued the planner must reconcile the three conflicted interests: "to 'grow' the economy, distribute this growth fairly, and in the process not degrade the ecosystem" (Campbell, 1996, p. 297).

Fitzgerald and Leigh (2002) were at the forefront of introducing the idea of sustainable development into the field of local economic development. They distinguished the goals of SLED from the traditional goals of economic growth and job creation. While traditional economic growth is defined as more jobs, more income, more taxes, etc., they defined SLED as “raising standards of living and improving the quality of life through a process that specifically lessens inequalities in metropolitan development and the metropolitan population’s standard of living” (Fitzgerald & Leigh, 2002, p. 27). They also argued that growth itself could not solely solve rising inequalities or diminishing opportunities for future generations. Therefore, the ultimate goal of local economic development should be to a build a sustainable local economy with equity and environmental quality norms co-equal with economic efficiency (Fitzgerald & Leigh, 2002).

Blakely & Leigh (2010) have extended this aspect of SLED, focusing on contemporary local economic development dealing with issues of climate change and goals of sustainability. They defined a form of SLED that focuses on the desired end state rather than growth-defined objectives as “local economic development is achieved when a community’s standard of living can be preserved and increased through a process of human and physical development that is based on principles of equity and sustainability” (Blakely & Leigh, 2010, p. 75). They emphasized several essential principles in their SLED definition, as follows (Blakely & Leigh, 2010, pp. 75-76):

SLED should establish a minimum standard of living for all and increase the standard over time. While traditional economic development has focused on job creations, SLED addresses job creation that provides living wages–earnings for full-time workers that are high enough to lift individuals and families out of poverty. A rising standard of living generally focuses on consumption of better consumer goods and quality housing. Other items associated with a rising standard of living include increasing the number of households receiving paid health care benefits and retirement plans, taking occasional family vacations, and sending their children to college.

SLED reduces growing inequality among people. One of the most distressing situations over the last decades has been the growing inequality in income and earnings. Some researchers argued that inequalities may only be a problem in the early stages of economic growth and higher average per capita income tends to reduce the overall income inequalities as the national economy grows (Kuznets, 1960). Since the1970s, however, most of the increased wealth generated by the gain in productivity growth has gone to the highest income class while wages for the middle and lower classes have risen at a far lesser rate than the rate of productivity growth (Bartik & Houseman, 2008; White House Task Force on the Middle Class, 2010). In 2007, incomes for the top 1 percent accounted for 23.5 percent of total U.S. income, which is the highest level of income concentration since 1928. The share of these higher income households jumped to 160% in 2002 while everyone else's share actually declined (White House Task Force on the Middle Class, 2010). This is strong evidence of income inequality: the fact that, at any given level of growth, a smaller share of the benefits of that growth is flowing to the middle class on down.

In addition, reducing wage and income inequality among different demographic groups (age, gender, race and ethnicity) and spatially defined groups (indigenous vs. immigrant or old-timers vs. newcomers) is one of the main goals in economic development practice (Fitzgerald & Leigh, 2002). Increased inequality among people may lead to an increase in the number of individuals who cannot obtain an affordable standard of living and could create greater political and social conflict and competition for scarce resources (Booza et al., 2006). Therefore, SLED ensures that certain groups and certain people are not "left behind" and that everyone benefits from economic growth.

SLED should reduce spatial inequality. Spatial or regional inequality among different kinds of economic or political units (major regions, metropolitan/non-metropolitan regions, and downtown, inner city, inner-ring suburbs, outer-ring suburbs, exurban, and rural within metropolitan area) is a central concern in SLED practice (Blakely & Leigh, 2010). Historically significant differences in income-levels among the major U.S. regions (Northeast, Midwest, South, and West) have received much attention. In particular, the South continues to have the lowest income levels, the highest poverty level, and the highest percentage of households without health insurance, compared to other regions (Blakely & Leigh, 2010).

Moreover, within the major regions, spatial differentiations exist between metropolitan and non-metropolitan areas. Despite consuming just 12 percent of U.S. land mass, one-third of all metropolitan areas contain most of the nation's population and economic activity: the 100 largest U.S. metropolitan areas contain 65 percent of the United States' population and 68 percent of its jobs, while generating 75 percent of the nations' gross domestic product (Berube, 2007).

Lee and Leigh (2005, 2007) discussed the issues of increasing metropolitan inequalities. While a growing number of metropolitan areas have initiated anti-sprawl development strategies, only a slim body of research exists on inner-ring suburbs and their role in metropolitan smart growth strategies (Lee & Leigh, 2005). Lee and Leigh

(2005) have addressed the fact that the suburbs continue to suffer from declining household income, aging housing stock, and a smaller population as the “back to downtown” trend increases (Lee & Leigh, 2007). They have argued that inner-ring suburban areas have different physical and socioeconomic conditions than those in inner-city neighborhoods, yet the inner-ring suburban areas are extremely important for smart growth strategies (Lee & Leigh, 2005).

SLED promotes and encourages sustainable resource use and production. While a growing number of metropolitan areas have initiated smart growth in the form of anti-sprawl development strategies, these initiatives do not always coordinate effectively with economic development concerns, such as industrial retention within the urban center and inner ring suburbs (Leigh & Hoelzel, 2012). Most current inner city developments have focused on commercial and residential uses and have applied increasing pressure to reduce industrial land within the urban core. For example, the City of Atlanta experienced a 12% reduction in the number of acres zoned for industrial use between 2004 and 2009 (Leigh et al., 2009). The rapid loss of industrial land leads to a corresponding decrease in the number of jobs, especially manufacturing jobs, for people in the urban center and inner ring suburbs.

To stem the decline of industrial land, SLED requires reuse of previously developed properties and vacant urban land (Fitzgerald & Leigh, 2002). A number of economic development strategies have emerged to meet this goal, including brownfield redevelopment, industrial and office property reuse, industrial retention, and commercial revitalization. These strategies provide job opportunities for poor urban neighborhoods and increase tax revenue in the short-term. They also promote sustainability by slowing greenfield consumption and suburbanization (or exurbanization) of manufacturing activities (Fitzgerald & Leigh, 2002).

2.3.2. The Link between Manufacturing FDI and SLED

The Location of Manufacturing FDI

Achieving the goals of SLED would require a better distribution of FDI to reduce spatial inequality. Recent locational patterns of FDI have shown a strong spatial concentration in the South where income levels continue to lag behind other regions of the U.S. (Coughlin et al., 1991; J. Friedman et al., 1992; Shannon et al., 1999). In particular, the regional distribution of employment for the manufacturing sector has tended to focus more heavily in the South. Although the region's right-to-work laws and lower wages are still controversial, the location of FDI in a Southern state certainly provides significant employment opportunities.

In addition, FDI may promote the reduction of metropolitan inequality and encourage the use and production of sustainable resources by coordinating with several SLED practices such as brownfield redevelopment, industrial and office property reuse, and commercial revitalization. Many studies addressing the challenges present in the location of American manufacturing found continuous trends of suburbanization and exurbanization of manufacturing jobs (Frey & Speare, 1988; Helper et al., 2012a; Kneebone, 2009; Stanback & Knight, 1976). Manufacturing firms and employment have shifted dramatically away from central cities and metropolitan areas. While much of the literature related to the location of manufacturing FDI has focused on inter-state (or regional) differences, very few studies attempt to examine the suburbanization and exurbanization patterns of manufacturing FDI.

As emphasized previously, current initiatives of smart growth or new urbanism often fail to ensure coordination with the principles of SLED, such as industrial retention within a central city or inner suburbs. However, FDI may be compatible with several SLED practices, such as brownfield development, industrial, office property reuse, and commercial revitalization.

Many regional and local economic development agencies employ highly skilled investment officials and, in some cases, offer site consulting to foreign investors. Thus, they are in a position to encourage the establishment of new businesses in brownfield sites or industrial and office property reuse sites within urban core areas with public incentives. Locating FDI in central cities and inner suburbs provides the opportunity for higher wage jobs. In addition, this strategy also serves as an energy efficient and environmentally effective strategy to combat global warming by reducing commuting distances for workers.

Manufacturing FDI and Middle Class

SLED requires good jobs in manufacturing FDI to reduce growing inequality among people. While many U.S. manufacturers moved their production activities overseas in search of lower production costs, FDI in the U. S. predominated in the manufacturing sector. Recent data from the Bureau of Economic Analysis shows that manufacturing was the leading sector with a much larger slice of the FDI pie than other industries. In 2010, foreign manufacturers offered 1.99 million jobs in the U.S.

The job creation component of FDI is an important factor in using economic development to reduce inequality, because manufacturing has historically been a primary source for middle class jobs. The disappearance of manufacturing jobs has (in-) directly led to the decline of the middle class. Attracting and retaining manufacturing jobs is now essential for obtaining job security for this class of Americans.

FDI-supported manufacturing jobs ensure more job security. Recent analysis shows that manufacturing FDI jobs tend to be more stable than domestic manufacturing jobs. Total manufacturing employment fell 24 percent, while manufacturing FDI jobs declined by only 11 percent between 1998 and 2008 (U.S. Economics and Statistics Administration, 2011).

In addition, numerous recent studies suggest that foreign companies pay higher wages than the average U.S.-owned plant. From 1998 to 2008, workers at foreign companies received 30 percent higher pay than workers at other U.S. firms (U.S. Economics and Statistics Administration, 2011). More recently, all jobs-related foreign companies (including direct, supply chain, and paycheck–spending-related jobs) average $58,500 in annual pay, which is approximately 17 percent higher than that in U.S. domestic plants ($50,100) in 2009 (PWC, 2012). Focusing specifically on foreign manufacturing plants in South Carolina, Figlio and Blonigen (2000) found that foreign investment raises local real wages much more than does domestic investment. They estimated that adding a single foreign plant to a county is associated with a more than 2.3 percent increase in real wages for all workers in foreign and domestic plants in that industry in the same county, while the estimated wage increase associated with an equal-sized new domestic plant is just 0.3 percent (Figlio & Blonigen, 2000).

Overall, manufacturing FDI may provide access to good quality employment opportunities with fair compensation and stable benefits. Thus, manufacturing FDI can play a key role in solving the issue of middle class decline and in building a stable middle class.

3. INTRA-REGIONAL SPATIAL PATTERNS OF FDI

3.1. Concepts and Methods for Intra-regional Spatial Patterns of FDI

3.1.1. Concepts

The first research objective in this study is to explore intra-regional spatial patterns created by manufacturing FDI in Georgia over time. The study identifies spatial patterns in two different levels of analysis. The first level identifies intra-state spatial patterns of manufacturing FDI. During the study period of 1990 to 2010, an annual average of 800 foreign manufacturing plants were located in Georgia and created an annual average of 70,000 jobs. However, the distribution of plants and the employment was not even across the 159 counties in the state. As described in the previous chapter, (Helper et al., 2012a)'s study found long-term exurbanization patterns of manufacturing employment between 1980 and 2011. In comparison, this study looks for whether a spatial concentration of manufacturing FDI exists in metropolitan areas, especially a large metropolitan area, compared to non-metropolitan areas. The study further identifies whether this spatial pattern will reinforce over time.

The second level of analysis tests intra-metropolitan suburbanization. Several previous studies on the geographic composition of manufacturing jobs provided similar results: a continuous trend of suburbanization of manufacturing jobs (Helper et al., 2012a; Kneebone, 2009; Stanback & Knight, 1976). Even though foreign manufacturers tend to cluster together in a large metropolitan area, the research expects that they are more likely to choose peripheral locations of the metropolitan area over time. This study analyzes the intra-metropolitan spatial pattern based on locations of manufacturing FDI in the 28-county Atlanta metropolitan area over the past two decades.

In addition, this study compares differences in intra-regional spatial patterns between foreign and domestic manufacturing, identifying them at both levels of analysis: intra-state and intra-metropolitan spatial differentiations.

3.1.2. Research Methods

This study uses Exploratory Spatial Data Analysis (ESDA) in GIS to test three research hypotheses related to the intra-regional spatial patterns of manufacturing FDI over time. Considering Exploratory Data Analysis (EDA) as data-driven analysis, in that it approaches the data without many preconceived, theories or hypotheses, ESDA is an extension of EDA to detect spatial properties of data. ESDA takes into account the spatial aspects of the data, focusing on spatial dependence (association) and spatial heterogeneity (Anselin, 1994). This method developed to describe spatial distributions, discover patterns of spatial clustering, suggest different spatial regimes or other forms of spatial instability (non-stationarity), and identify outliers.

Recently, several studies of industrial locational pattern utilized ESDA. Currid and Williams (2010) conducted ESDA to compare spatial dynamics of cultural industry firm location patterns in New York and Los Angeles. Using geographical information systems, Williams and Currid-Halkett (2011) found that Los Angeles has emerged as an important center for the fashion industry behind the conventional fashion hub in New York. Guillain and Le Gallo (2010) also used ESDA to identify the agglomeration patterns of 26 manufacturing and service sectors in and around Paris in 1999.

Recently, GIS software packages, such as ArcGIS and GeoDa, added a new set of statistics tools allowing for the easier performance of ESDA (Scott & Janikas, 2010). This study uses the Spatial Statistics toolbox in ArchGIS 10.

Several specific analyses exist for describing and modeling spatial patterns, distributions, trends, processes and relationship of the manufacturing FDI. First, Mean Center, Standard Distance, and Standard Deviational Ellipse tools measure geographic distributions. The Mean Center tool identifies the geographic center of manufacturing FDI. The Standard Distance and the Standard Deviational Ellipse tools measure the degree to which manufacturing FDI is concentrated or dispersed around the geographic mean center and generate a directional trend of manufacturing FDI. In addition, measuring changes of mean center, standard distance, and standard deviational ellipse over time reveals the movements of the geographic center and the changes in degree of concentration for the period from 1990 to 2010. The study performs these analyses with X and Y coordinates for each individual location of manufacturing FDI (point feature) weighted by its employment level.

Second, this study uses the Global Moran's *I* tool to test statistically whether spatial autocorrelation (clustering) occurs based on locations of manufacturing FDI and its attributes (e.g. employment) in order to identify overall patterns or trends. It computes a single summary value, a z-score, describing the statistical significance of spatial concentration or dispersion for manufacturing FDI. Comparing the summary value, year by year, shows whether spatial clustering of manufacturing FDI has increased or decreased more. The study performs this analysis at the county-level, and aggregates the number of manufacturing employments into each of the state's 159 counties for each year from 1990-2010.

Third, the research employs the Hot Spot Analysis (or Getis-Ord Gi*) tool to delineate clusters of manufacturing FDI with values significantly higher or lower than the overall study area's mean or average value. While this analysis runs at the county level for intra-state spatial pattern across the state's 159 counties, it performs a zip-code level analysis for intra-metropolitan spatial pattern within the 28-county Atlanta MSA.

3.2. Intra-state Spatial Patterns of FDI

3.2.1. Manufacturing FDI in Georgia

Georgia is one of the largest recipients of FDI in the U.S. manufacturing sector, and manufacturing FDI has been an important factor in the Georgia economy. Table 3.1 shows the numbers of manufacturing establishments and employments in each category in Georgia. During the past two decades, an annual average of 800 foreign manufacturing plants existed in the state, providing an annual average of 70,000 jobs. The number of domestic manufacturing establishments steadily increased from 1990 to 2008, but a huge downturn began in 2009. In contrast, the number of manufacturing FDI establishments was relatively stable. Manufacturing FDI reached its zenith in 2002 with 934 establishments. Despite the overall downturn from 2003, the 752 establishments of manufacturing FDI recorded in 2010 still outpaced the numbers in the early 1990s.

While domestic manufacturing firms experienced significant job losses, FDI-supported manufacturing jobs generally held steady over the last two decades. Total domestic manufacturing jobs fell by about 143,000, or 23.8 percent, between 1990 and 2010 while the manufacturing FDI jobs declined by only 1.2 percent or about 800 jobs. This suggests that the manufacturing FDI jobs tended to be more stable than the domestic manufacturing jobs during this period. Despite the decline in the share of new establishments, the share of employment held by manufacturing FDI firms has largely increased over time. The 65,509 manufacturing FDI jobs in 1990 accounted only for 9.8 percent of total employment in the manufacturing sector in Georgia, but this share increased to 12.3 percent in 2010 with 64,691 jobs.

Table 3.1. Manufacturing Establishment and Employment by Type in Georgia

YEAR	Establishment			Employment			Share of Foreign Mfg.	
	All (Growth) **A**	Domestic(Growth)	Foreign(Growth) **B**	All (Growth) **C**	Domestic (Growth)	Foreign (Growth) **D**	Est. (B/A)	Emp. (D/C)
1990	14,726	14,130	596	667,723	602,214	65,509	4.0%	9.8%
1991	14,743 (0.1%)	14,123 (0.0%)	620 (4.0%)	651,972 (-2.4%)	580,625 (-3.6%)	71,347 (8.9%)	4.2%	10.9%
1992	14,759 (0.1%)	14,127 (0.0%)	632 (1.9%)	637,394 (-2.2%)	567,924 (-2.2%)	69,470 (-2.6%)	4.3%	10.9%
1993	15,496 (5.0%)	14,791 (4.7%)	705 (11.6%)	666,205 (4.5%)	593,231 (4.5%)	72,974 (5.0%)	4.5%	11.0%
1994	15,517 (0.1%)	14,826 (0.2%)	691 (-2.0%)	639,693 (-4.0%)	571,362 (-3.7%)	68,331 (-6.4%)	4.5%	10.7%
1995	16,970 (9.4%)	16,248 (9.6%)	722 (4.5%)	660,957 (3.3%)	591,214 (3.5%)	69,743 (2.1%)	4.3%	10.6%
1996	17,253 (1.7%)	16,516 (1.6%)	737 (2.1%)	659,693 (-0.2%)	588,142 (-0.5%)	71,551 (2.6%)	4.3%	10.8%
1997	17,833 (3.4%)	17,059 (3.3%)	774 (5.0%)	666,104 (1.0%)	592,311 (0.7%)	73,793 (3.1%)	4.3%	11.1%
1998	18,686 (4.8%)	17,869 (4.7%)	817 (5.6%)	676,647 (1.6%)	605,461 (2.2%)	71,186 (-3.5%)	4.4%	10.5%
1999	19,030 (1.8%)	18,192 (1.8%)	838 (2.6%)	678,895 (0.3%)	606,068 (0.1%)	72,827 (2.3%)	4.4%	10.7%
2000	19,430 (2.1%)	18,561 (2.0%)	869 (3.7%)	705,844 (4.0%)	633,104 (4.5%)	72,740 (-0.1%)	4.5%	10.3%
2001	20,388 (4.9%)	19,482 (5.0%)	906 (4.3%)	728,811 (3.3%)	653,791 (3.3%)	75,020 (3.1%)	4.4%	10.3%
2002	21,722 (6.5%)	20,788 (6.7%)	934 (3.1%)	735,665 (0.9%)	656,201 (0.4%)	79,464 (5.9%)	4.3%	10.8%
2003	22,288 (2.6%)	21,379 (2.8%)	909 (-2.7%)	686,980 (-6.6%)	613,485 (-6.5%)	73,495 (-7.5%)	4.1%	10.7%
2004	22,447 (0.7%)	21,523 (0.7%)	924 (1.7%)	658,742 (-4.1%)	582,651 (-5.0%)	76,091 (3.5%)	4.1%	11.6%
2005	22,967 (2.3%)	22,078 (2.6%)	889 (-3.8%)	658,839 (0.0%)	579,791 (-0.5%)	79,048 (3.9%)	3.9%	12.0%
2006	24,374 (6.1%)	23,489 (6.4%)	885 (-0.4%)	644,035 (-2.2%)	568,023 (-2.0%)	76,012 (-3.8%)	3.6%	11.8%
2007	25,098 (3.0%)	24,243 (3.2%)	855 (-3.4%)	624,011 (-3.1%)	551,593 (-2.9%)	72,418 (-4.7%)	3.4%	11.6%
2008	26,300 (4.8%)	25,454 (5.0%)	846 (-1.1%)	603,070 (-3.4%)	534,146 (-3.2%)	68,924 (-4.8%)	3.2%	11.4%
2009	27,120 (3.1%)	26,274 (3.2%)	846 (0.0%)	590,695 (-2.1%)	523,761 (-1.9%)	66,934 (-2.9%)	3.1%	11.3%
2010	23,376 (-13.8%)	22,624 (-13.9%)	752 (-11.1%)	523,852 (-11.3%)	459,161 (-12.3%)	64,691 (-3.4%)	3.2%	12.3%

However, the distribution of jobs created by foreign manufacturing plants was not even across Georgia's 159 counties. A total of 111counties had at least one location of manufacturing FDI between 1990 and 2010, while the other 48 counties had no manufacturing FDI. Thus, the ratio of jobs attributable to foreign manufacturing plants as compared to total manufacturing employment varies significantly among the counties, ranging from zero to 46 percent.

Figure 3.1 shows the distributions of FDI manufacturing employment for the top 10 counties in Georgia. With an annual average of 9,000 jobs, Gwinnett County was the leader in FDI employment. Fulton, Cobb, and DeKalb Counties had the second, third, and fourth largest FDI employment with annual averages of 5,400, 4,300, and 4,100 employees, respectively. These top four counties are within the 28-county Atlanta MSA and were followed by Richmond (3,300), Hall (2,900), Peach (2,200), Columbia (2,100), Coweta (2,100), and Clarke (1,700) Counties. All these counties are within metropolitan areas except Peach County.

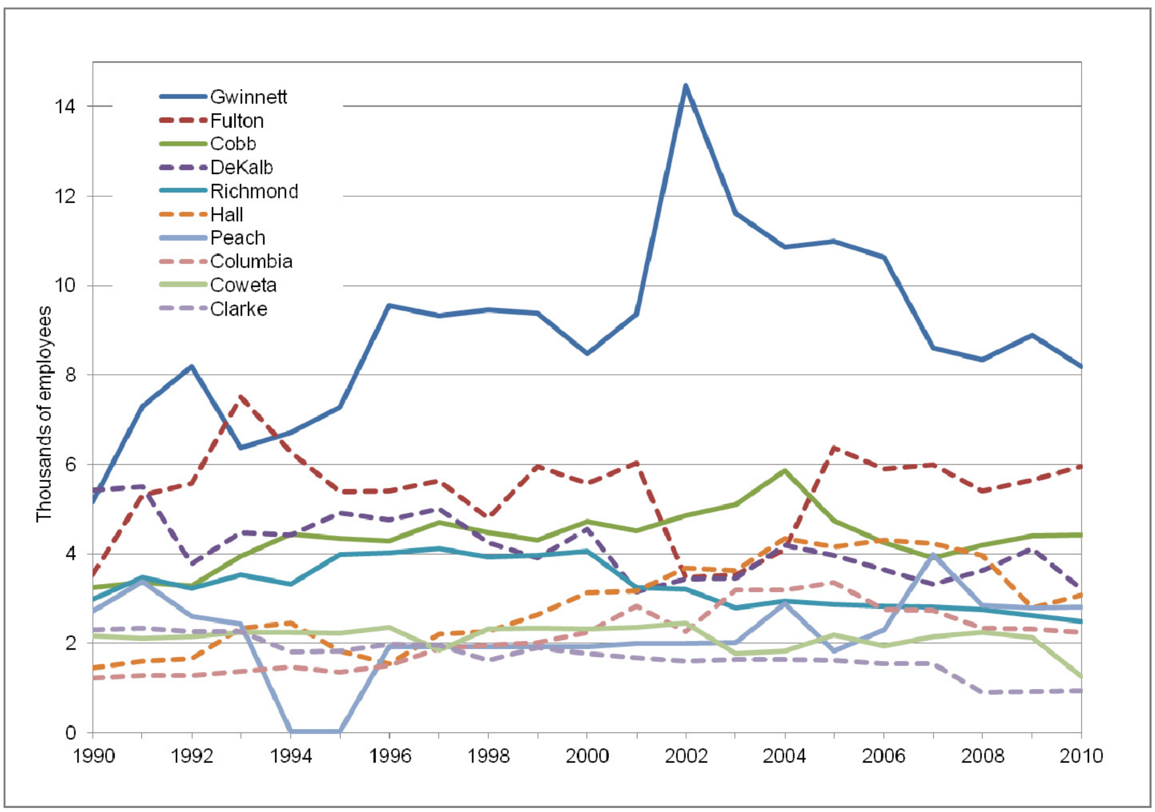

Figure 3.1. Top 10 Counties by Manufacturing FDI Employment in Georgia

3.2.2. Spatial Differentiation between MSAs and Non-MSAs

Manufacturing FDI businesses tended to locate more frequently in metropolitan areas, including the Atlanta, Macon, Rome, Savannah, Augusta, and Columbus MSAs (see Figure 3.2). Thus, activities by foreign manufacturing firms also tended to be greatest in the 28-county Atlanta MSA.

Measured by their employment between 1990 and 2010, activity by foreign manufacturing firms tended to be highest in the 28-county Atlanta MSA. In 1990, the share of manufacturing FDI employment in the 28-county Atlanta MSA (28,800 employees) as compared to total manufacturing employment in Georgia (667,700 employees) was 4.3% (See Figure 3.3). This share has increased over time. With over 35,100 employees in 2010, FDI-related employment in the 28-county Atlanta MSA accounted for 6.7 percent of total employment in Georgia's manufacturing sector. While employment in foreign manufacturing firms decreased from 17,700 in 1990 to 14,800 in 2010 for Georgia's small MSAs (MSAs other than the 28-county Atlanta MSA), the relative share of total manufacturing employment in Georgia has not changed significantly (2.6 percent in 1990 vs. 2.8 percent in 2010). Similarly, manufacturing FDI employment in non-MSAs also decreased, from 19,000 in 1990 to 14,800 in 2010, but its share of total manufacturing employment in Georgia has not changed significantly (2.8 percent in 1990 vs. 2.8 percent in 2010).

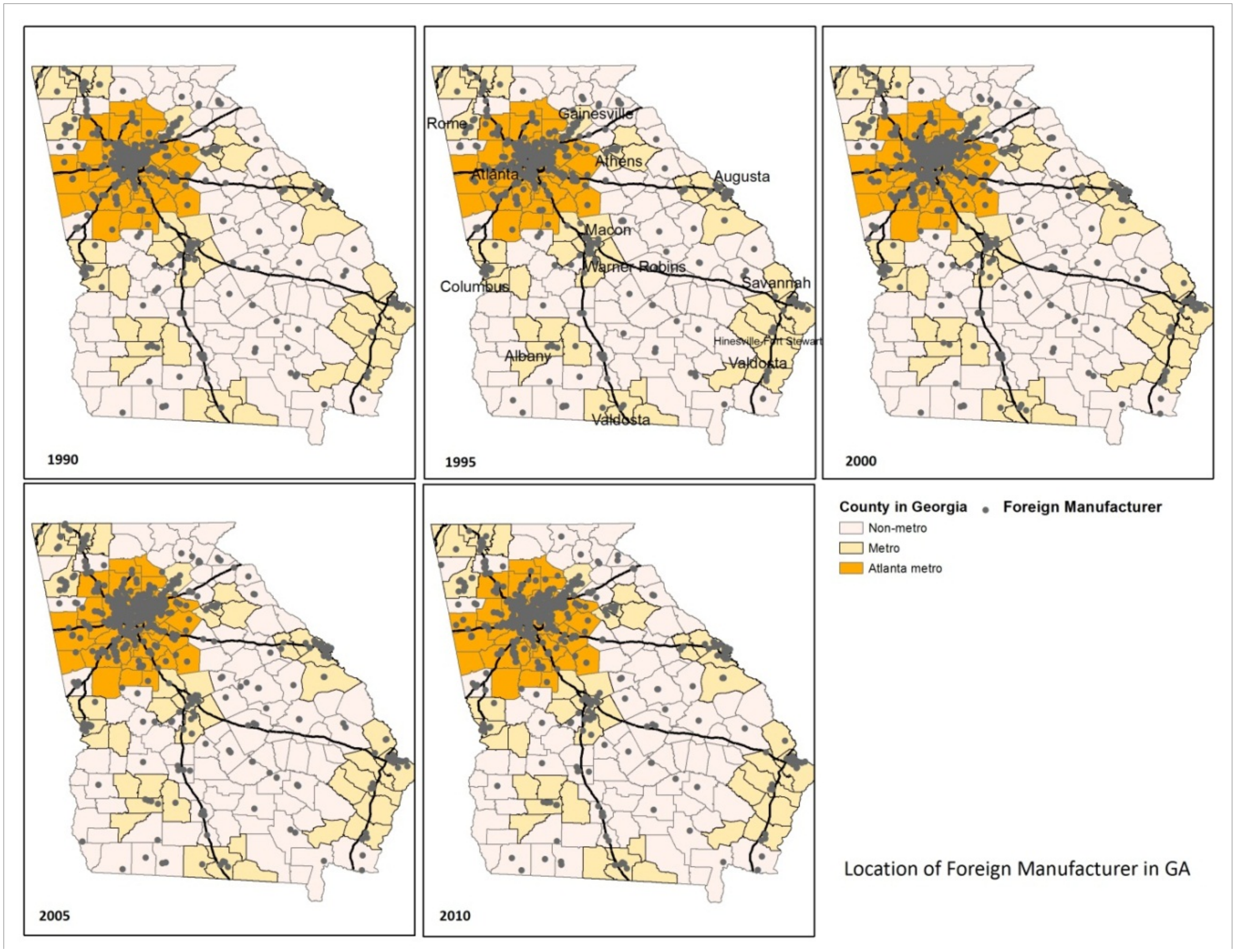

Figure 3.2. Locations of Manufacturing FDI in Georgia

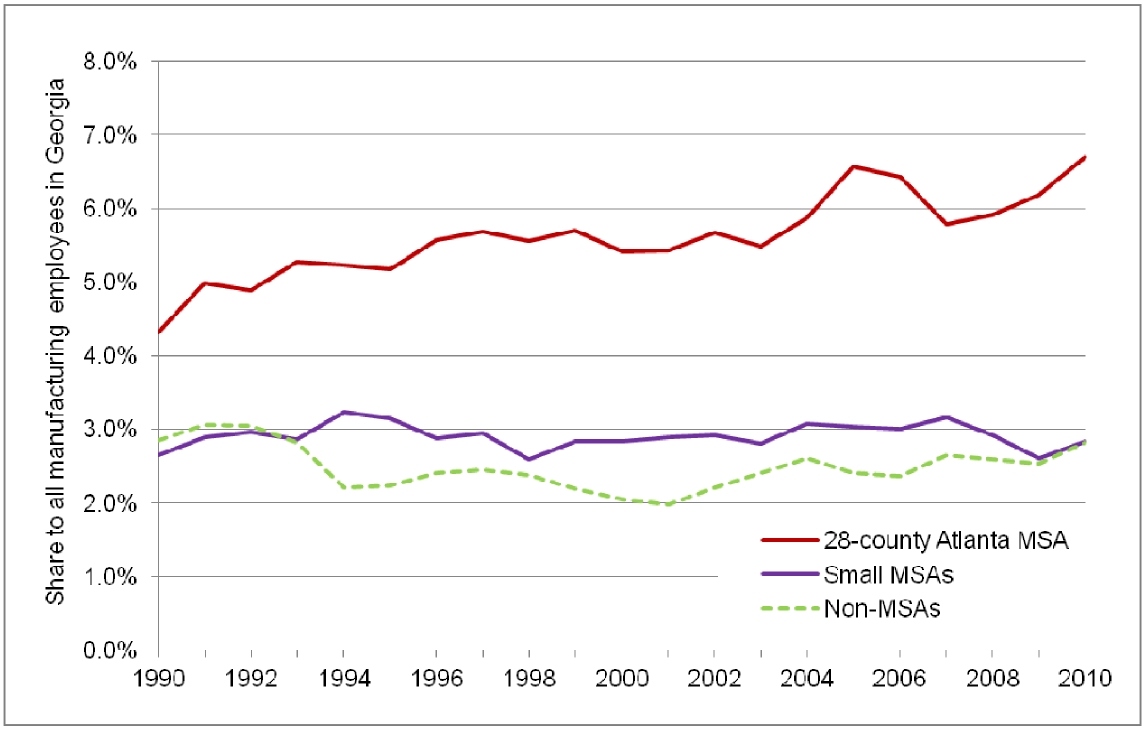

Figure 3.3. Share of manufacturing FDI to Georgia total manufacturing employment

Figure 3.4 shows the percentage change in manufacturing FDI employment by metropolitan area status. Overall, MSAs in Georgia gained manufacturing FDI jobs over the past two decades, but this result primarily was associated with a significant increase in manufacturing FDI employment in the 28-county Atlanta MSA, an increase of 21.8 percent between 1990 and 2010. In contrast, small MSAs and non-MSAs experienced significant job losses during the same period, a decrease of 16.1 percent and 22.4 percent, respectively. Nevertheless, the rapid job growth in the 1990s in the 28-county Atlanta MSA contributed to the two-decade overall growth rate. In the 1990s, the number of manufacturing FDI employments increased in the 28-county Atlanta MSA and small MSAs, while the number in the non-MSAs decreased. In the 2000s, however, the job growth rates shifted dramatically. Only non-MSAs gained jobs, while all other MSAs lost them.

These results are inconsistent with the prior study by Helper et al. (2012a) that suggested long-term exurbanization patterns of manufacturing employment. Despite a temporary pause of the exurbanization in the 2010s, they found that the 100 largest MSAs lost manufacturing jobs, while small MSAs and non-MSAs gained them between 1981 and 2011(Helper et al., 2012a). This study finds, however, that the 28-county Atlanta MSA (one of the largest MSAs) gained manufacturing FDI jobs at a faster rate, while small MSAs and non-MSAs lost them. This implies that a spatial pattern differentiation may exist between foreign and domestic manufacturing. This study further analyzes this differentiation, and the results appear in subchapter 3.4, below.

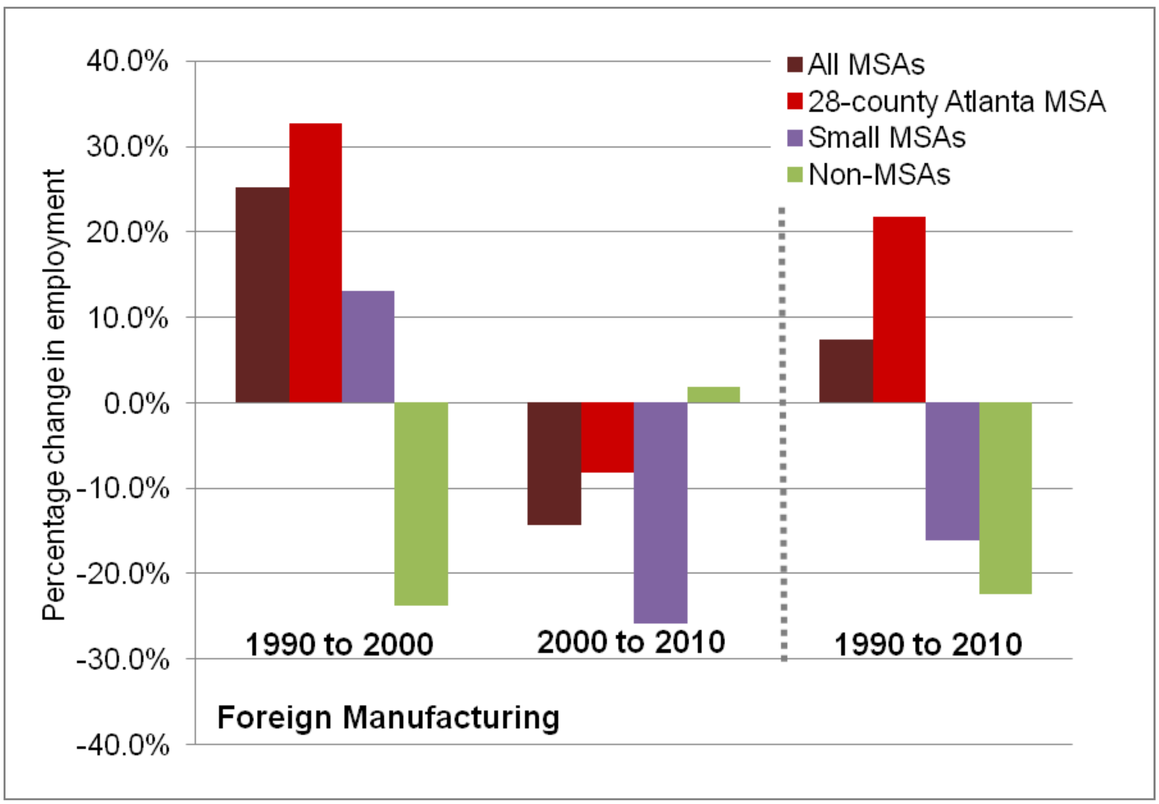

Figure 3.4. Percentage Change in Manufacturing FDI Employment by MSA Status

3.2.3. Intra-state Spatial Patterns of FDI with Spatial Statistics

To describe and analyze statistically the spatial patterns and trends of manufacturing FDI employment, this study uses several spatial statistics tools. First, it employs mean center and standard distance to measure geographic distribution of manufacturing FDI employment. The mean center identifies the geographic center of manufacturing FDI employment, and the standard distance measures the degree to which manufacturing FDI employment is concentrated or dispersed around the geographic mean center. By measuring changes in the mean center and standard distance over time, the analysis identifies the change in spatial pattern for the period of 1990 to 2010.

Figure 3.5 illustrates changes in mean center and standard distance of manufacturing FDI in Georgia over time. The mean center of foreign manufacturing (weighted by its employment) has moved toward the center of the Atlanta metropolitan area in the last two decades. The standard distance of foreign manufacturer (weighted by its employment) has decreased, indicating stronger spatial concentration over time. Overall, a strong spatial concentration of manufacturing FDI continued in the Atlanta metropolitan area and this spatial concentration of the jobs has only reinforced over time.

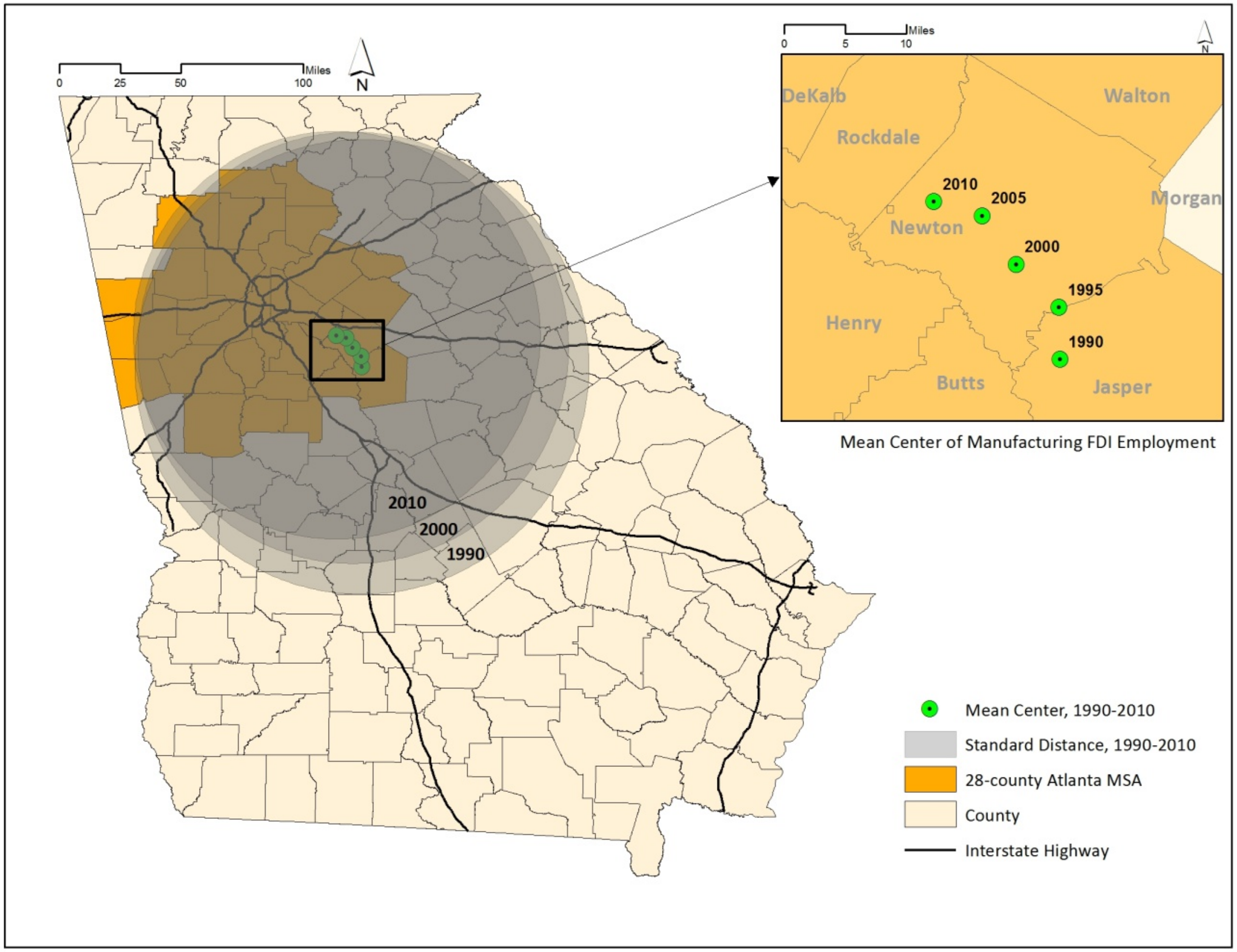

Figure 3.5. Change of Mean Center and Standard Distance of Manufacturing FDI in Georgia, 1990-2010

Next, this study uses Global Moran's *I* tool to test statistically whether spatial clustering of manufacturing FDI employment occurs. The global Moran's *I* values range from −1 (indicating perfect dispersion) to +1 (perfect correlation). A zero value indicates a random spatial pattern. In calculating the Moran's *I* values, the study uses several types of strategies to determine the spatial relationships among the features (counties) in ArcGIS 10, including inverse distance, fixed distance band, zone of indifference, polygon contiguity, K nearest neighbors, Delaunay triangulation, and space-time windows options. This study constructs the spatial relationships based on the contiguity edges and 50-mile fixed distance options. In addition, by comparing the global Moran's *I* values year by year, the analysis identifies whether spatial clustering of manufacturing FDI employment has increased or decreased more over time.

Figure 3.6 shows the changes in global Moran's *I* values from 1990 to 2010. The figures indicate a general trend of increasing spatial concentration of manufacturing FDI employment. All p-values are statistically significant at the 1 percent level, and the z-scores are positive. In 1990, the global Moran's *I* values with the contiguity edges corners option for manufacturing FDI employment was 0.31. With the exception of a sharp decrease in 2002, the value has increased over time, and reached 0.46 in 2010. The graph with the 50-mile distance option shows smaller values but similar trends.

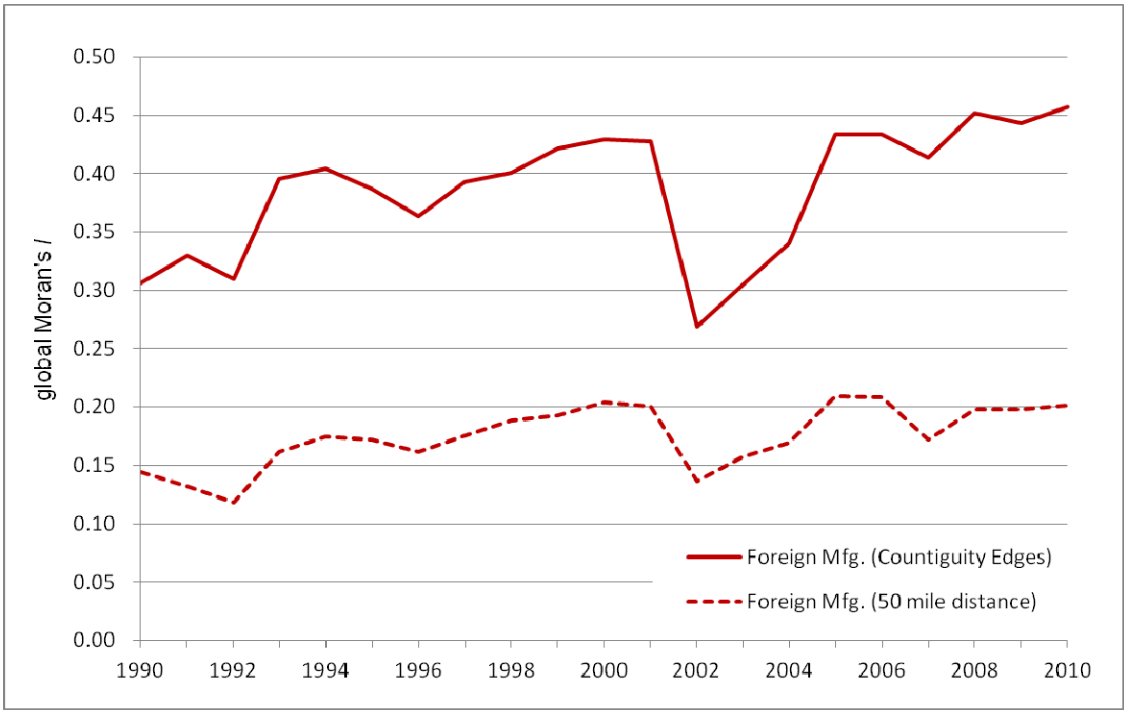

Figure 3.6. Change of global Moran's *I* for Manufacturing FDI Employment in Georgia, 1990-2010

Next, the study performs Hot Spot Analysis (or Getis-OrdGi*) to know where counties with either high or low values cluster spatially. Not all counties with a high employment level of manufacturing FDI are a statistically significant hot spot. To be a statistically significant hot spot, a county must not only have a high employment level but also be surrounded by other counties with a high employment level. The same is true for low employment level counties, which must be surrounded by other counties with a low employment level in order to create cold spots.

Figure 3.7 shows the result of the Hot Spot analysis. The red areas are hot spot counties for manufacturing FDI employment, and the analysis identifies these areas in the 28-county Atlanta MSA for the study period. In 1990 and 1995, only three counties were hot spot counties with over 3.0 of Gi*z-score (dark red areas), but since 2000, a number of these hot spot counties extended into the counties of the north Atlanta MSA. This result suggests that a stronger spatial concentration occurred in the 28-county Atlanta MSA over time, and this local pattern of spatial concentration has reinforced the positive value of the global Moran's *I* (spatial cluster of manufacturing FDI employment) previously discussed.

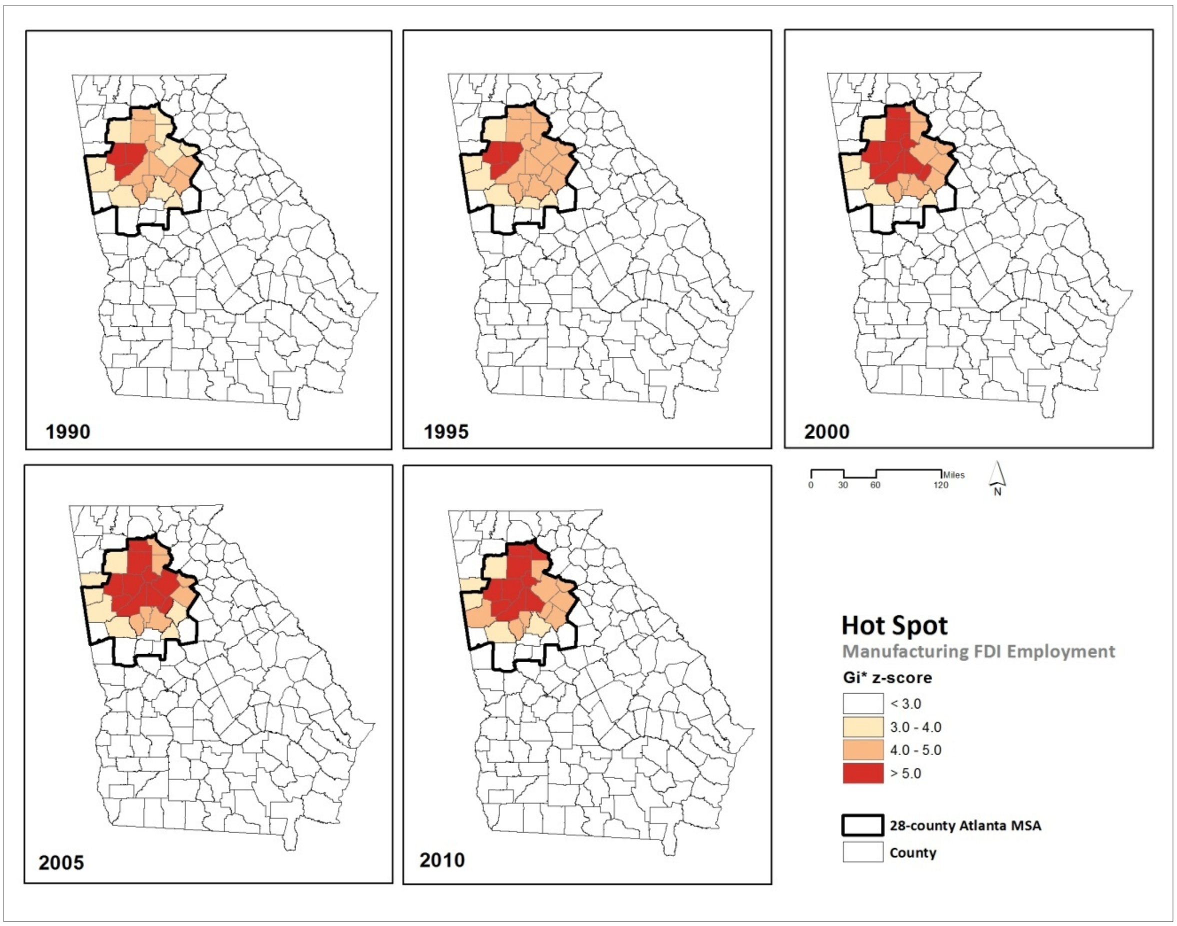

Figure 3.7. Hot Spot Map for Foreign Manufacturing Employment, 1990-2010

3.3. Intra-metropolitan Spatial Patterns of FDI

3.3.1. Manufacturing FDI in the 28-county Atlanta MSA

Table 3.2 shows the number of manufacturing establishment and employment in each category in the 28-county Atlanta MSA. Domestic manufacturing establishment has steadily increased from 1990 to 2008, but a huge downturn occurred beginning in 2009. In contrast, manufacturing FDI establishment was relatively stable. With 623 establishments, this number reached its highest level in 2002, but the numbers decreased from 2003 to 2010.

While domestic manufacturing firms experienced large job losses, FDI-supported manufacturing jobs increased over the last two decades. Total domestic manufacturing jobs fell by about 24,000, or 9.7 percent, between 1990 and 2010, while the manufacturing FDI jobs increased about 6,300, or 21.8 percent. This comparison suggests that manufacturing FDI jobs tend to be more stable than the domestic manufacturing jobs. During the last two decades, an annual average of about 500 foreign manufacturing plants were located in the state and provided annual average of 36,000 jobs.

Despite a decline in the establishment share, the share of manufacturing FDI employment has largely increased over time. Manufacturing FDI jobs numbered 28,814 in 1990, accounting only for 10.5 percent of total employment in the manufacturing sector in the 28-county Atlanta MSA, and this share increased to 13.6 percent in 2010 with 35,102 jobs.

Table 3.2. Manufacturing Establishment and Employment by Type in the 28-countyAtlanta MSA

YEAR	Establishment			Employment			Share of Foreign Mfg.	
	All (Growth) **A**	Domestic(Growth)	Foreign(Growth) **B**	All (Growth) **C**	Domestic (Growth)	Foreign (Growth) **D**	Est. (B/A)	Emp. (D/C)
1990	7,976	7,591	385	275,182	246,368	28,814	4.8%	10.5%
1991	7,987 (0.1%)	7,583 (-0.1%)	404 (4.9%)	259,640 (-5.6%)	227,103 (-7.8%)	32,537 (12.9%)	5.1%	12.5%
1992	8,066 (1.0%)	7,656 (1.0%)	410 (1.5%)	250,822 (-3.4%)	219,671 (-3.3%)	31,151 (-4.3%)	5.1%	12.4%
1993	8,606 (6.7%)	8,138 (6.3%)	468 (14.1%)	267,918 (6.8%)	232,789 (6.0%)	35,129 (12.8%)	5.4%	13.1%
1994	8,647 (0.5%)	8,188 (0.6%)	459 (-1.9%)	264,515 (-1.3%)	231,011 (-0.8%)	33,504 (-4.6%)	5.3%	12.7%
1995	9,552 (10.5%)	9,071 (10.8%)	481 (4.8%)	276,212 (4.4%)	242,049 (4.8%)	34,163 (2.0%)	5.0%	12.4%
1996	9,723 (1.8%)	9,234 (1.8%)	489 (1.7%)	271,397 (-1.7%)	234,636 (-3.1%)	36,761 (7.6%)	5.0%	13.5%
1997	10,122 (4.1%)	9,613 (4.1%)	509 (4.1%)	281,949 (3.9%)	244,090 (4.0%)	37,859 (3.0%)	5.0%	13.4%
1998	10,688 (5.6%)	10,143 (5.5%)	545 (7.1%)	292,363 (3.7%)	254,782 (4.4%)	37,581 (-0.7%)	5.1%	12.9%
1999	10,905 (2.0%)	10,349 (2.0%)	556 (2.0%)	297,362 (1.7%)	258,678 (1.5%)	38,684 (2.9%)	5.1%	13.0%
2000	11,182 (2.5%)	10,610 (2.5%)	572 (2.9%)	318,627 (7.2%)	280,376 (8.4%)	38,251 (-1.1%)	5.1%	12.0%
2001	11,736 (5.0%)	11,131 (4.9%)	605 (5.8%)	327,309 (2.7%)	287,770 (2.6%)	39,539 (3.4%)	5.2%	12.1%
2002	12,577 (7.2%)	11,954 (7.4%)	623 (3.0%)	348,200 (6.4%)	306,414 (6.5%)	41,786 (5.7%)	5.0%	12.0%
2003	13,012 (3.5%)	12,412 (3.8%)	600 (-3.7%)	327,302 (-6.0%)	289,645 (-5.5%)	37,657 (-9.9%)	4.6%	11.5%
2004	13,105 (0.7%)	12,501 (0.7%)	604 (0.7%)	315,943 (-3.5%)	277,251 (-4.3%)	38,692 (2.7%)	4.6%	12.2%
2005	13,491 (2.9%)	12,915 (3.3%)	576 (-4.6%)	321,793 (1.9%)	278,499 (0.5%)	43,294 (11.9%)	4.3%	13.5%
2006	14,486 (7.4%)	13,919 (7.8%)	567 (-1.6%)	310,162 (-3.6%)	268,726 (-3.5%)	41,436 (-4.3%)	3.9%	13.4%
2007	15,036 (3.8%)	14,485 (4.1%)	551 (-2.8%)	297,350 (-4.1%)	261,237 (-2.8%)	36,113 (-12.8%)	3.7%	12.1%
2008	15,882 (5.6%)	15,331 (5.8%)	551 (0.0%)	296,665 (-0.2%)	260,966 (-0.1%)	35,699 (-1.1%)	3.5%	12.0%
2009	16,455 (3.6%)	15,902 (3.7%)	553 (0.4%)	301,774 (1.7%)	265,201 (1.6%)	36,573 (2.4%)	3.4%	12.1%
2010	14,148 (-14.0%)	13,664 (-14.1%)	484 (-12.5%)	257,514 (-14.7%)	222,412 (-16.1%)	35,102 (-4.0%)	3.4%	13.6%

3.3.2. Intra-metropolitan Spatial Patterns of Manufacturing FDI

To identify and visualize the geographic distribution of manufacturing FDI jobs throughout the 28-county Atlanta MSA, this study constructs an interpolated surface of manufacturing FDI employment. After creating 2-mile-by-2-mile grid cells, the study aggregates the number of employment in every foreign firm location into each grid cell point, and then interpolates a raster surface using inverse distance weighted technique in ArcGIS 10. Figure 3.8 shows spatial patterns of manufacturing FDI employment in five selected years over the past two decades.

Nearly 6,300 jobs in foreign manufacturing firms were added to the 28-county Atlanta MSA between 1990 and 2010, but this job growth primarily occurred in the northern part of the metropolitan area. The maps for the years 1990-2010 in Figure 3.8 demonstrate an emerging job cluster of manufacturing FDI in the suburbs of Gwinnett, Cobb and north Fulton Counties, while the center of the metropolitan area (the City of Atlanta and/or the area inside I-285, which circles the city) experienced significant job loss. In the 1990s, the center of the metropolitan area had relatively high concentrations of manufacturing FDI jobs, but those jobs have moved toward the north. Northwest Gwinnett County, along the I-85 northeast corridor, saw a 58.5 percent increase in jobs between 1990 and 2010, while Northeast Cobb County, along the I-75 northwest corridor, saw a 36.0 percent increase. In addition, significant job growth occurred in the area around Alpharetta in north Fulton County, along Georgia State Highway 400, especially in the 2000s.

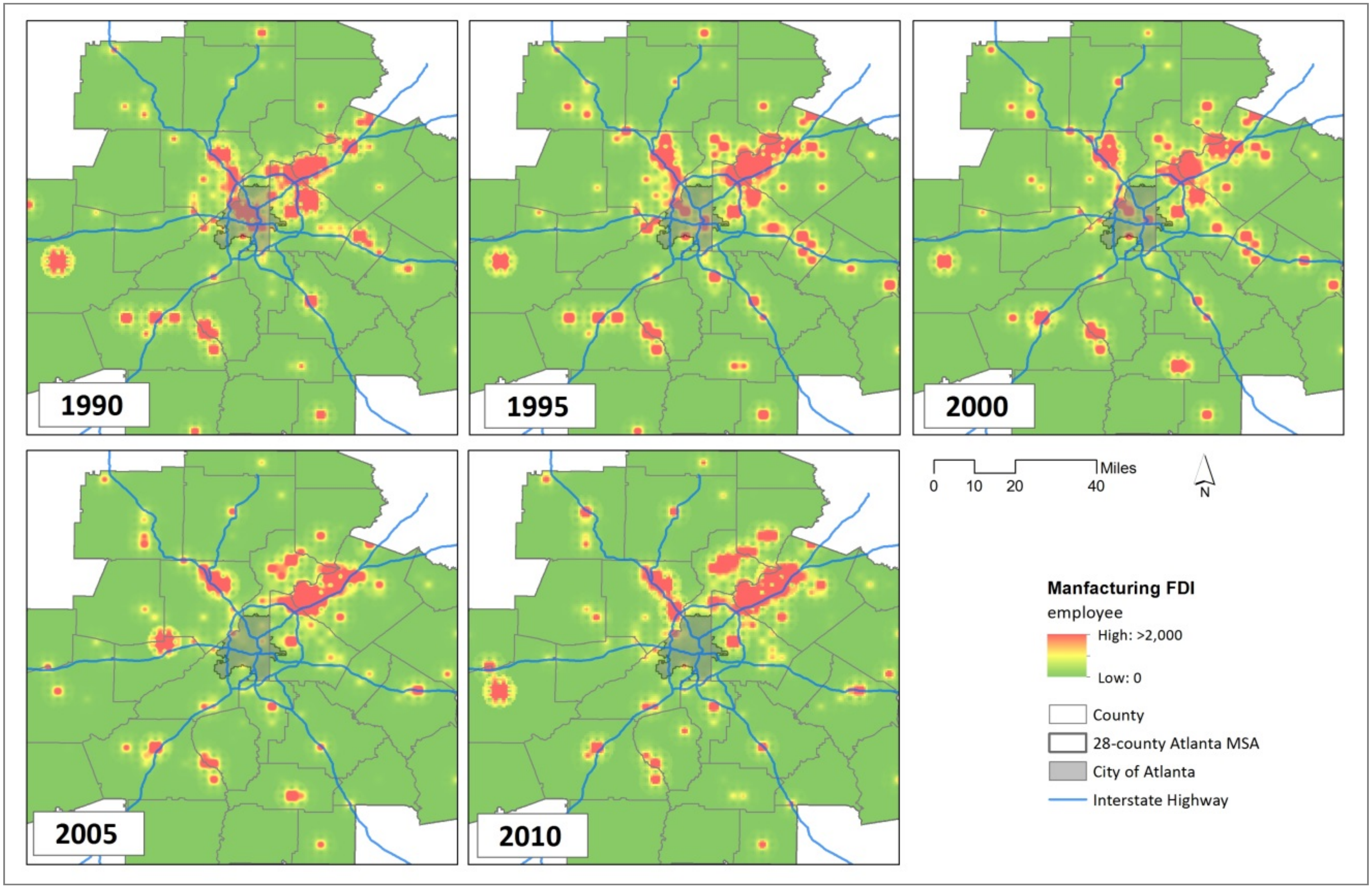

Figure 3.8. Location of Manufacturing FDI Employment in the 28-county Atlanta MSA, 1990-2010

3.3.3. Intra-metropolitan Spatial Patterns of FDI with Spatial Statistics

Figure 3.9 shows changes in mean center and standard distance for manufacturing FDI in the 28-county Atlanta MSA for the period of 1990 to 2010. The mean center of manufacturing FDI employment moved approximately 6.6 miles north, away from the center of the Atlanta MSA between 1990 and 2010. In the 1990s, the movement of mean center was toward the northeast along the I-85 corridor, but the direction has changed since 2010, moving instead toward the northwest. This result is associated with significant job growth in Northeast Cobb County, along the I-75 northwest, corridor and the area around Alpharetta in north Fulton County, along highway 400, as described above.

In addition, the standard deviational ellipse of foreign manufacturing FDI employment has increased for the last two decades, indicating its spatial dispersion over time. Overall, the change of mean center and standard deviational ellipse demonstrates that jobs in foreign manufacturing firms were moving outward to the northern areas, away from the core of the metropolitan area, demonstrating the gradual suburbanization of manufacturing FDI jobs in the 28-county Atlanta MSA over the past two decades.

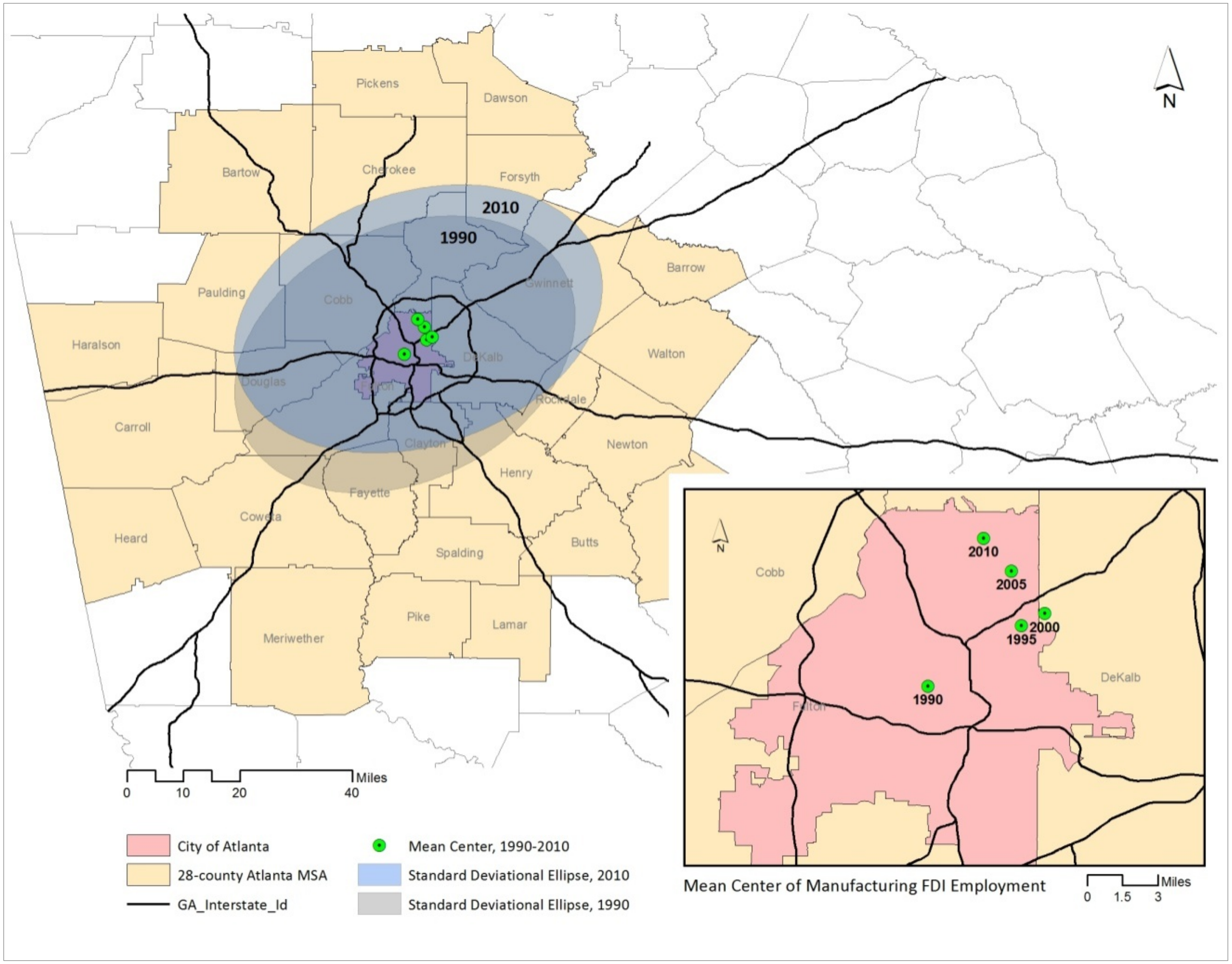

Figure 3.9. Change of Mean Center and Standard Deviational Ellipse of Manufacturing FDI Employment in the 28-countyAtlanta MSA, 1990-2010

Global Moran's *I* values are calculated in zip-code level to identify whether spatial clustering of manufacturing FDI employment has increased or decreased more within the 28-county Atlanta MSA between 1990 and 2010. Figure 3.10 shows a general trend of increasing spatial concentration of manufacturing FDI employment within the Atlanta MSA. To identify hot or cold spots for manufacturing FDI within the metropolitan area, the study performs zip-code level Hot Spot analysis. The result of this analysis also indicates the suburbanization of manufacturing FDI jobs in the 28-county Atlanta MSA (See Figure 3.11). The study identifies hot spot areas for manufacturing FDI employment northeast of the metropolitan area, which spread out over time. In contrast, the central metropolitan area has become a cold spot (blue area), indicating greater clustering of areas with low manufacturing FDI employment surrounded by other areas with low employment.

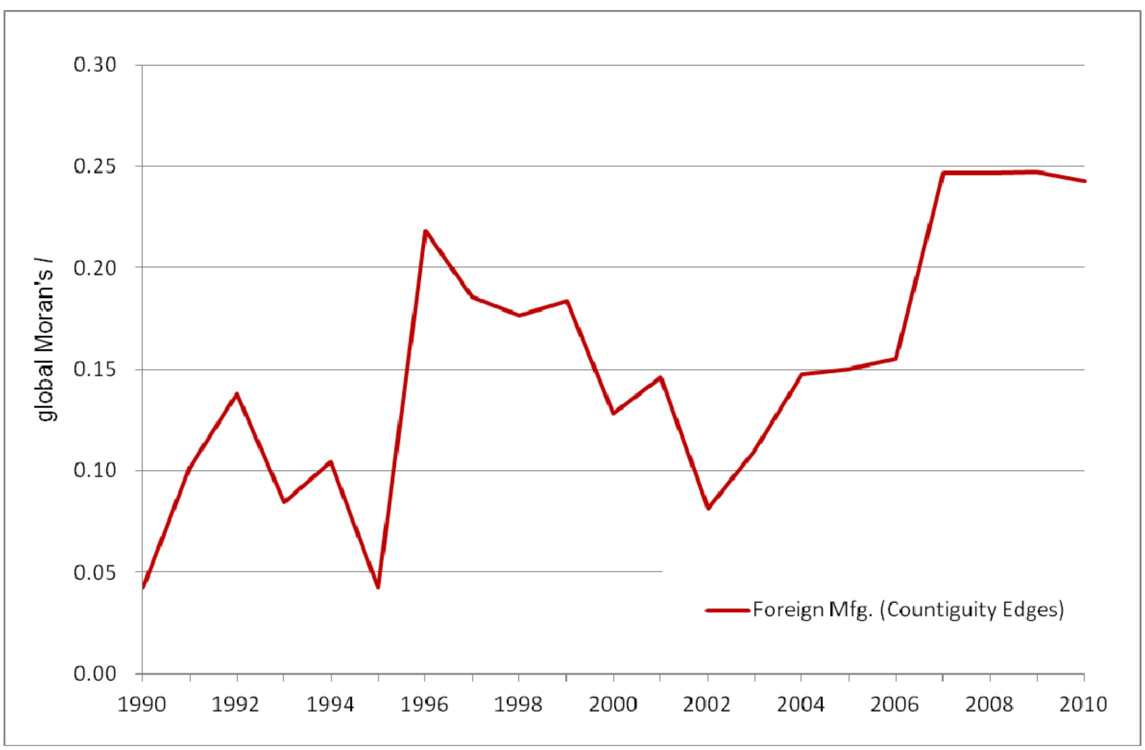

Figure 3.10. Change of global Moran's *I* for Manufacturing FDI Employment in the 28-countyAtlanta MSA, 1990-2010

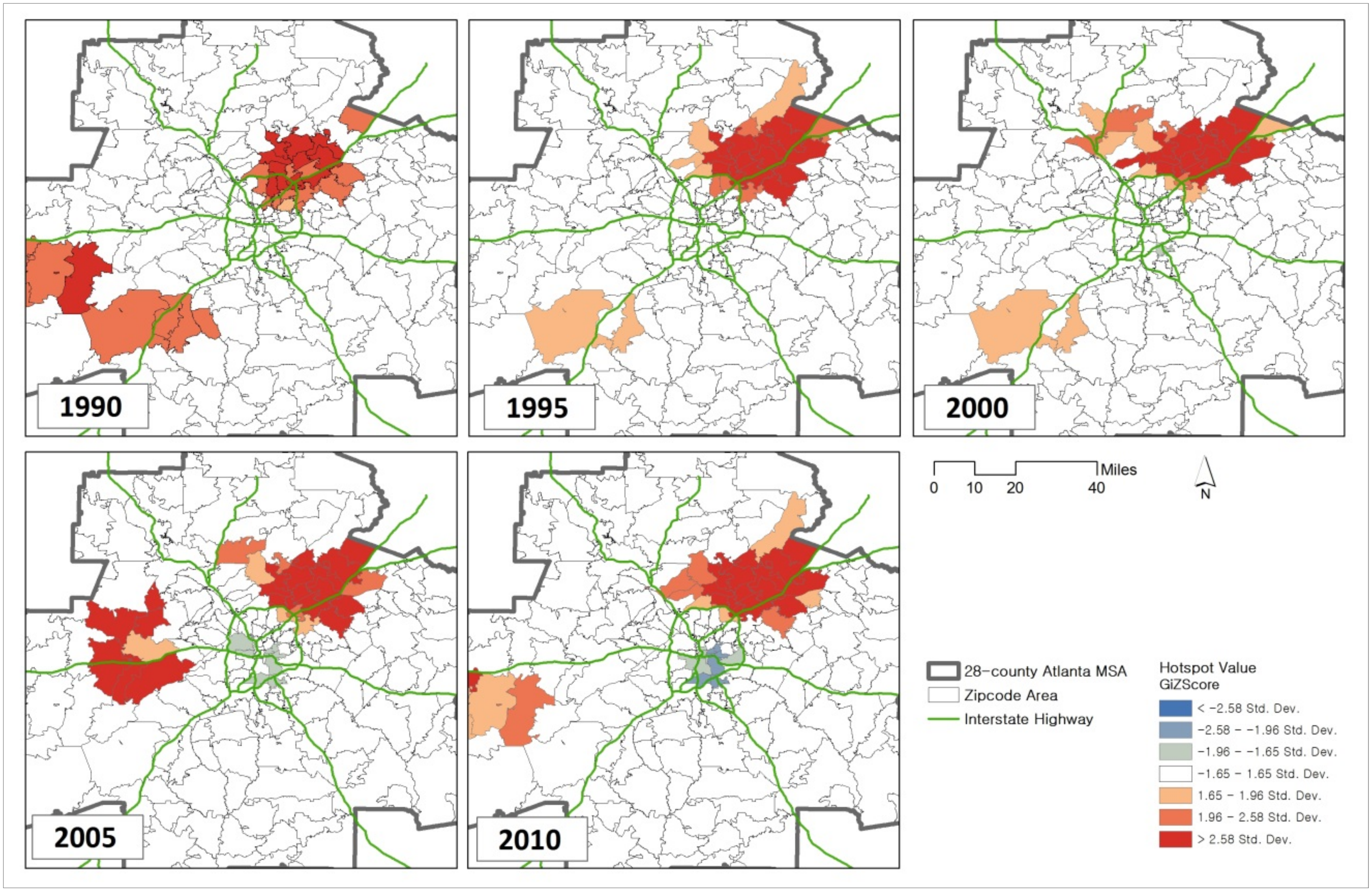

Figure 3.11. Hot Spot for Manufacturing FDI Employment in the 28-county Atlanta MSA, 1990-2010

3.4. Spatial Differentiation between Foreign and Domestic Manufacturing

3.4.1. Intra-state Spatial Differentiation

Figure 3.12 shows the percentage change in foreign and domestic manufacturing employment by metropolitan area status. As described above, a significant increase in manufacturing FDI jobs occurred in the 28-county Atlanta MSA between 1990 and 2010, while small MSAs and non-MSAs lost foreign manufacturing jobs.

In contrast, the percentage change in domestic manufacturing jobs shows a different pattern. Job declines in domestic manufacturing occurred in all types of metropolitan areas over the same period. Domestic manufacturing jobs in small MSAs and non-MSAs fell by 38.7 percent (or about 6,600) and 28.6 percent (or about 5,300), respectively. The 28-county Atlanta MSA similarly experienced significant job decline, registering a 9.7 percent decrease (or 2,400).

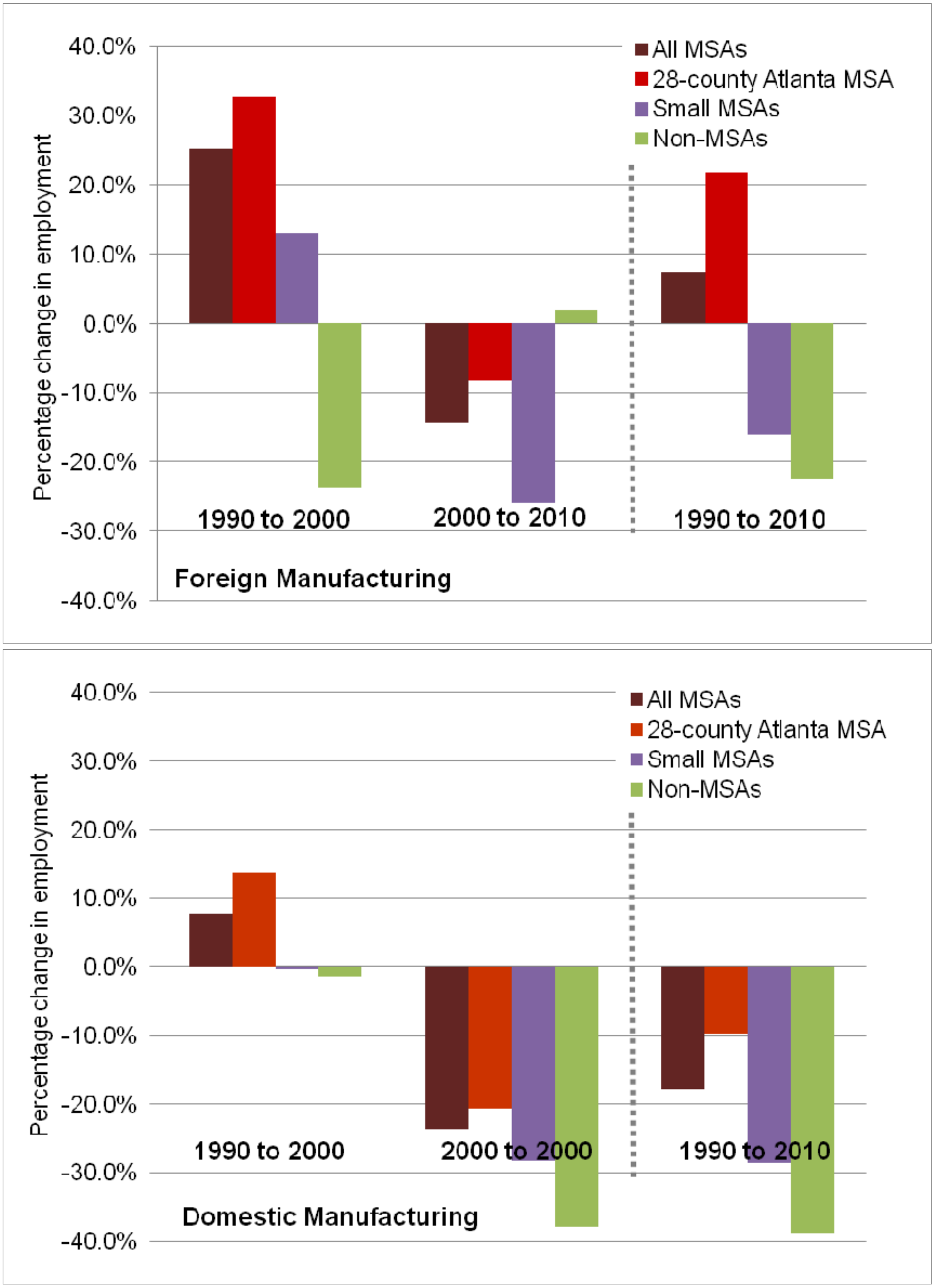

Figure 3.12. Percentage Change in Manufacturing Employment by MSA Status: Foreign (Top) and Domestic (Bottom)

Figure 3.13 shows the changes of global Moran's *I* values for foreign and domestic manufacturing employment. The figure illustrates a general trend of increasing spatial concentration in both foreign and domestic manufacturing, but the global Moran's *I* values for manufacturing FDI employment are generally larger than the values for domestic manufacturing employment. This result suggests that manufacturing FDI jobs have stronger spatial clusters than domestic manufacturing jobs have.

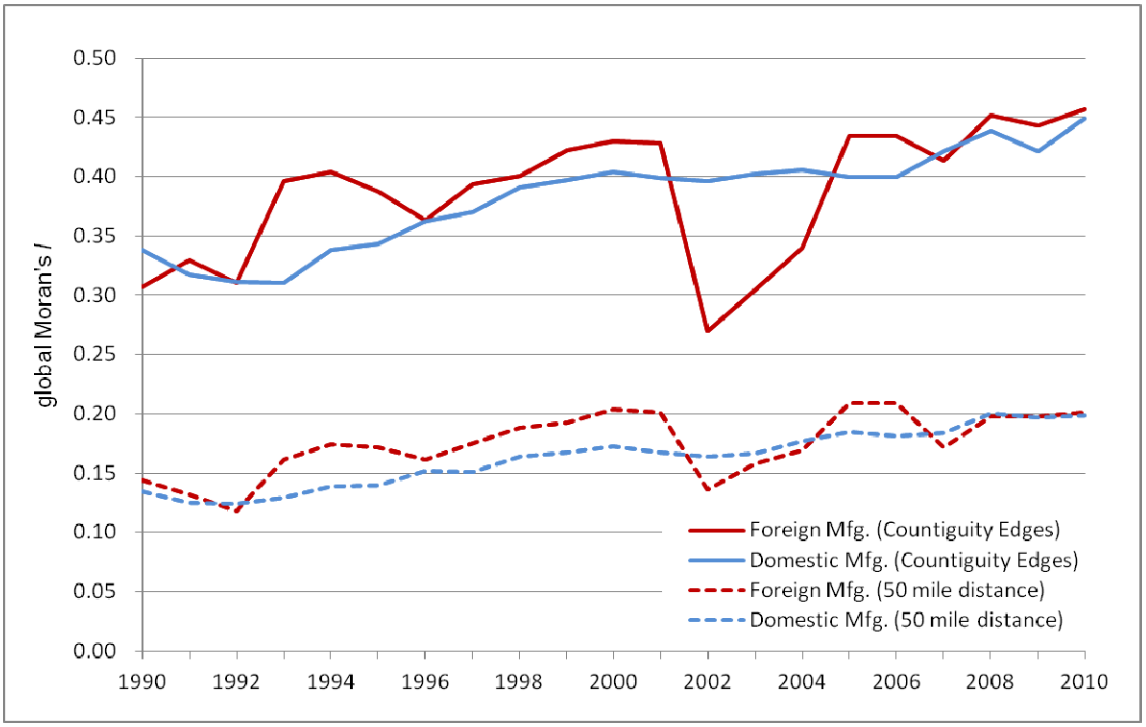

Figure 3.13. Change of global Moran's *I* for Foreign and Domestic Manufacturing Employment in Georgia, 1990-2010

3.4.2. Intra-metropolitan Spatial Differentiation

Within the 28-county Atlanta MSA, the manufacturing FDI employment increased by about 6,300 jobs, or 21.8 percent, from 1990 to 2010, while domestic manufacturing experienced a significant job loss of about 24,000 jobs, or 9.7 percent. As discussed above, the job growth in manufacturing FDI occurred primarily in the northern part of the metropolitan area (See Figure 3.14), with Gwinnett, Cobb and north Fulton Counties as the main beneficiaries. Strikingly, manufacturing job clusters in the City of Atlanta and the central areas of the metropolitan area (inside I-285) have disappeared since 2000.

The study revealed a similar pattern for domestic manufacturing employment. Jobs in domestic manufacturing also moved outward into the northern areas of the metropolitan area, especially in Gwinnett, Cobb, and north Fulton Counties (See Figure 3.15). Notably, however, the central areas of the metropolitan area retained a significant number of domestic manufacturing jobs, while manufacturing FDI jobs moved away from those areas.

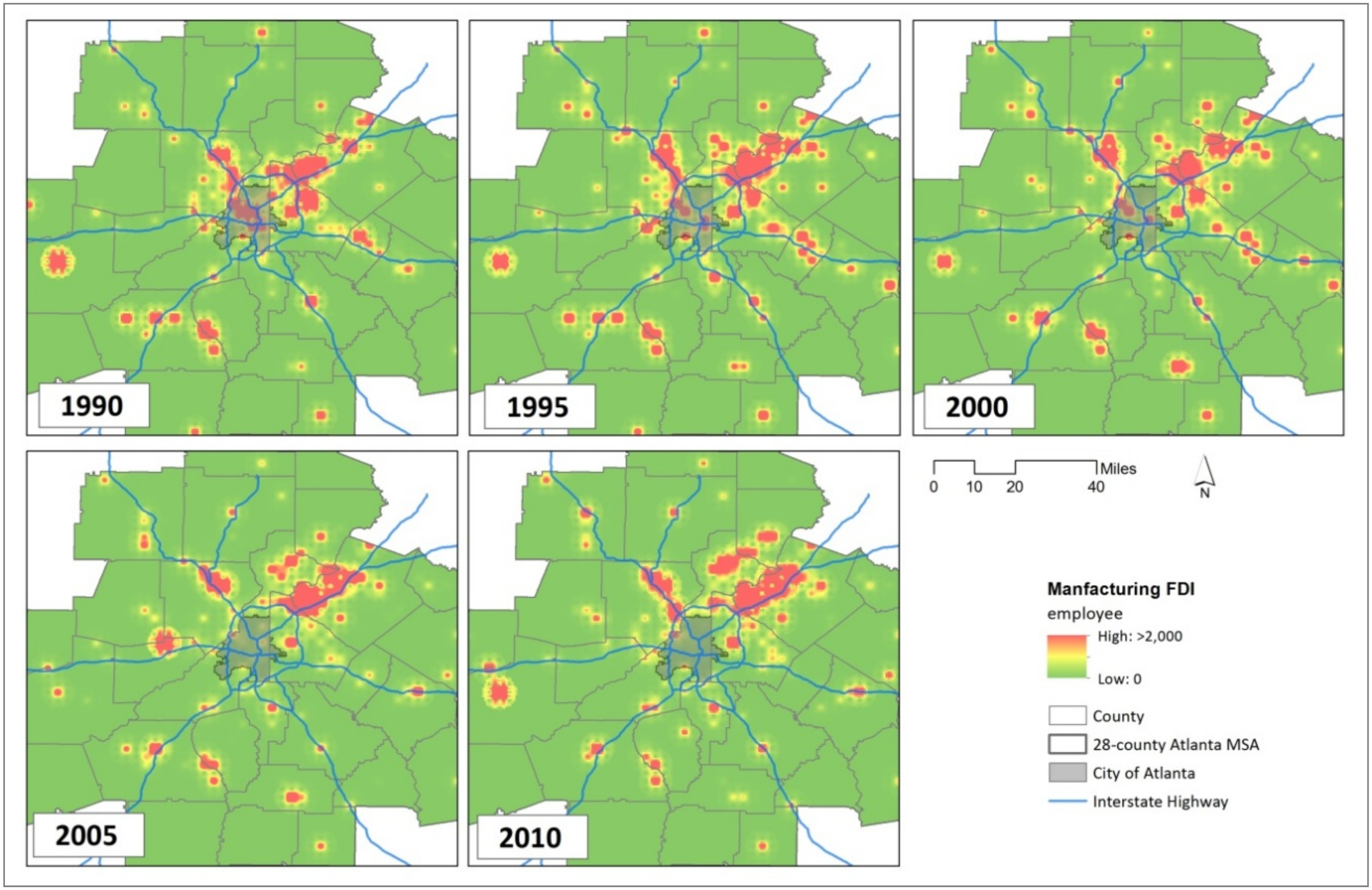

Figure 3.14. Location of Manufacturing FDI Employment in the 28-county Atlanta MSA

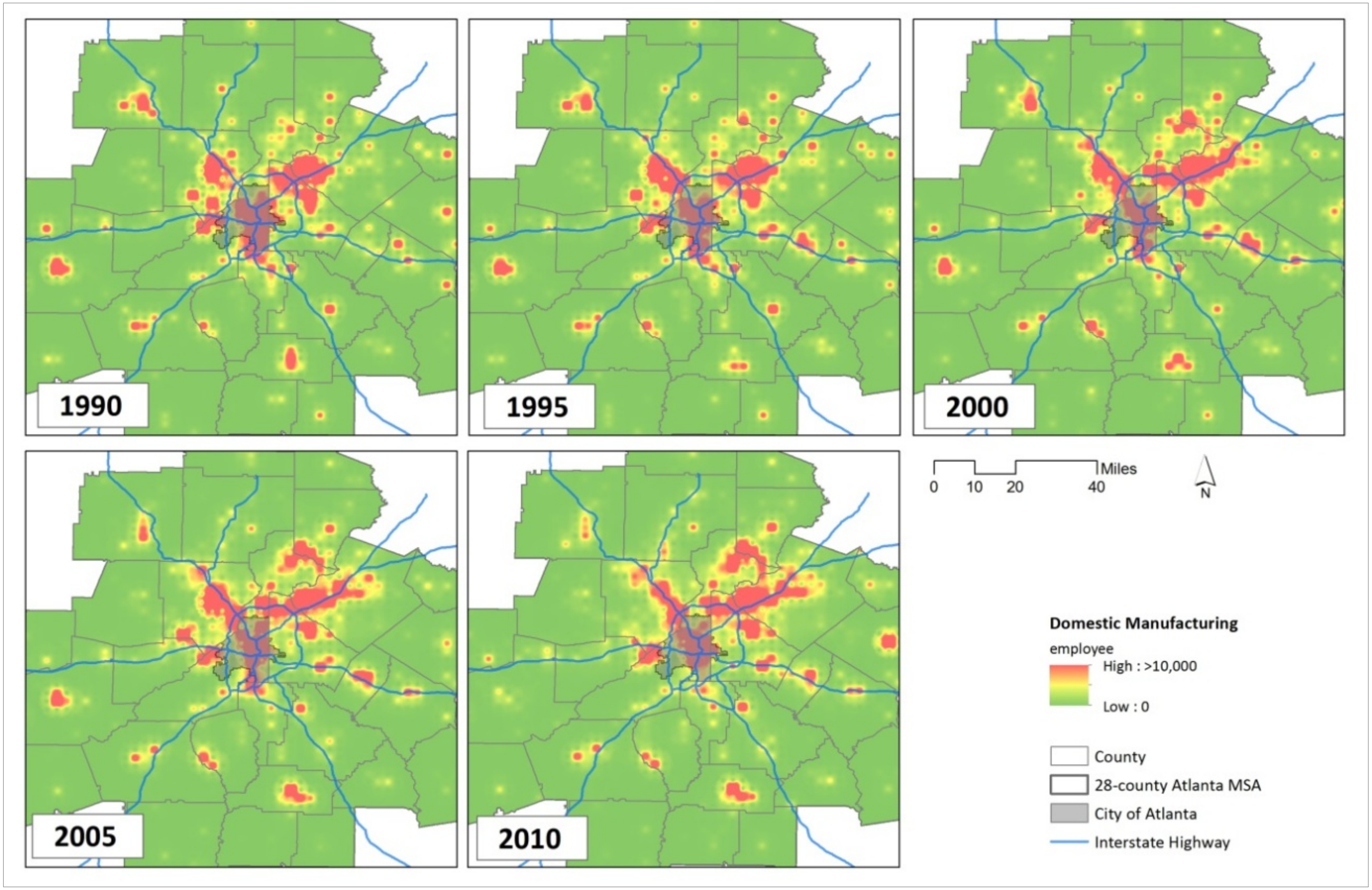

Figure 3.15. Location of Domestic Manufacturing Employment in the 28-county Atlanta MSA, 1990-2010

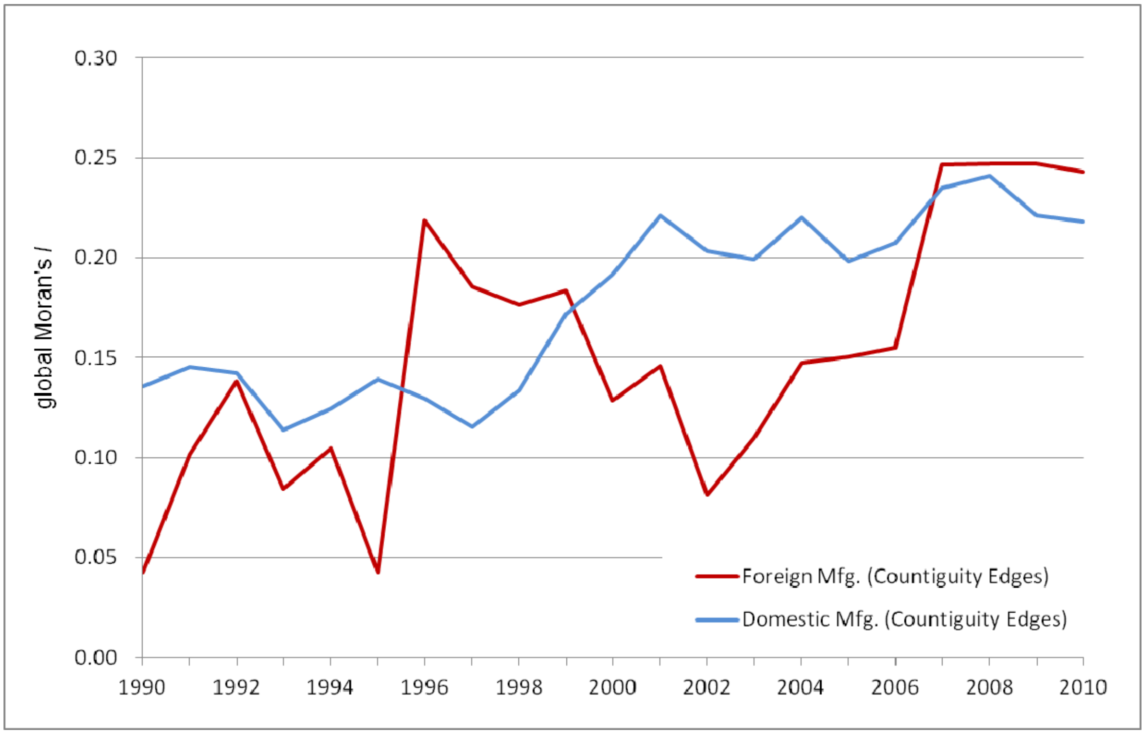

Figure 3.16. Change of global Moran's *I* for Foreign and Domestic Manufacturing Employment in the 28-county Atlanta MSA, 1990-2010

The change of glabal Moran's I values in Figure 3.16 indicate both foreign and domestic manufacturing employments have clustered more closely to each other over time within the 28-county Atlanta MSA. The results of the Hot Spot analysis, performed at the zip-code level, clearly demonstrate different suburbanization patterns for foreign and domestic manufacturing employment over time. Figure 3.17 and Figure 3.18 identify hot spot areas for both foreign and domestic manufacturing employment in the north portion of the metropolitan area, and these hot spots spread out over time. However, the City of Atlanta and the central areas of the metropolitan area (inside I-285) have different patterns. While these areas have become cold spots for manufacturing FDI employment (See Figure 3.17), they remain hot spots for domestic manufacturing employment (See Figure 3.18).

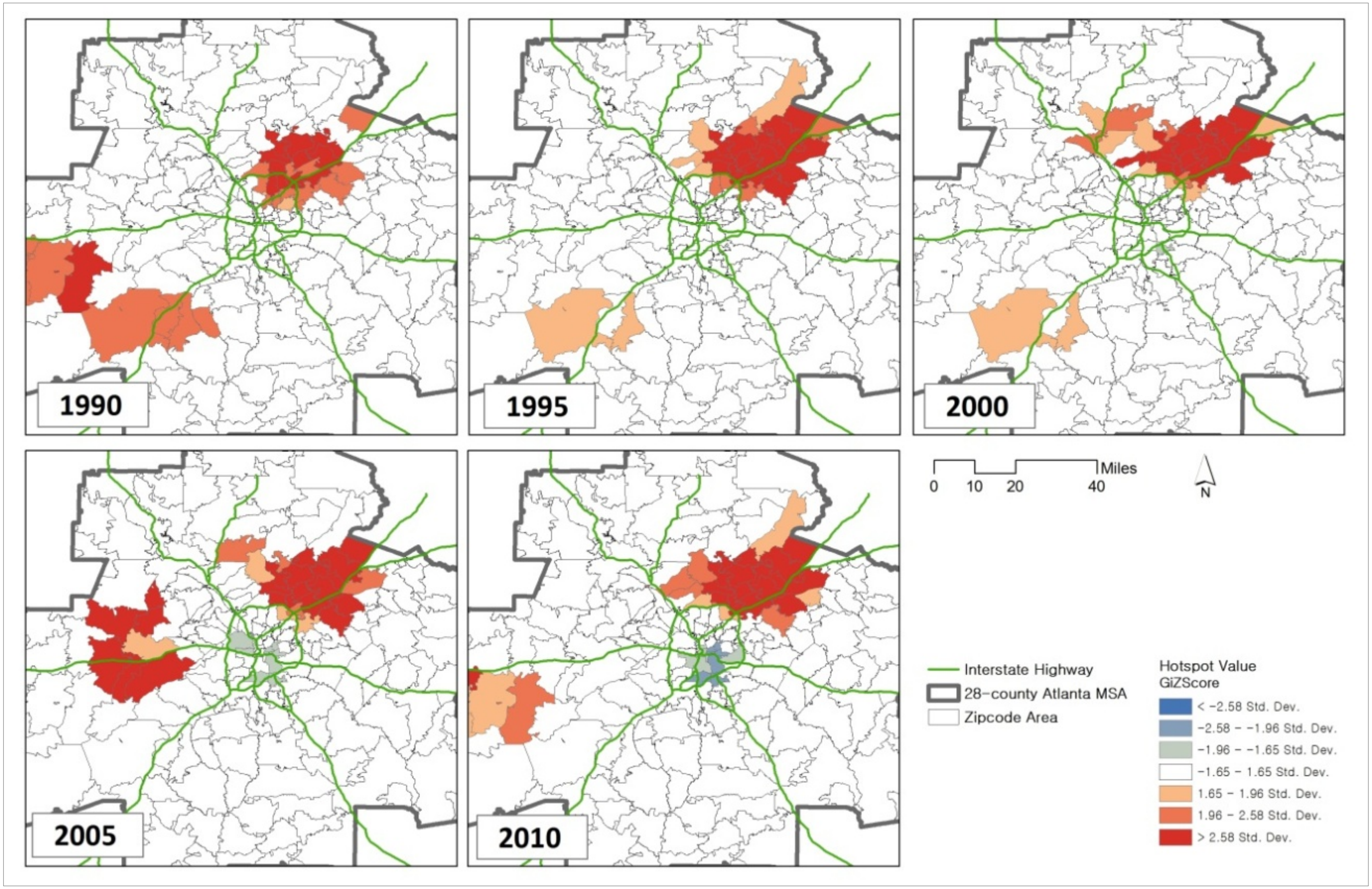

Figure 3.17. Hot Spot for Manufacturing FDI Employment in the 28-county Atlanta MSA, 1990-2010

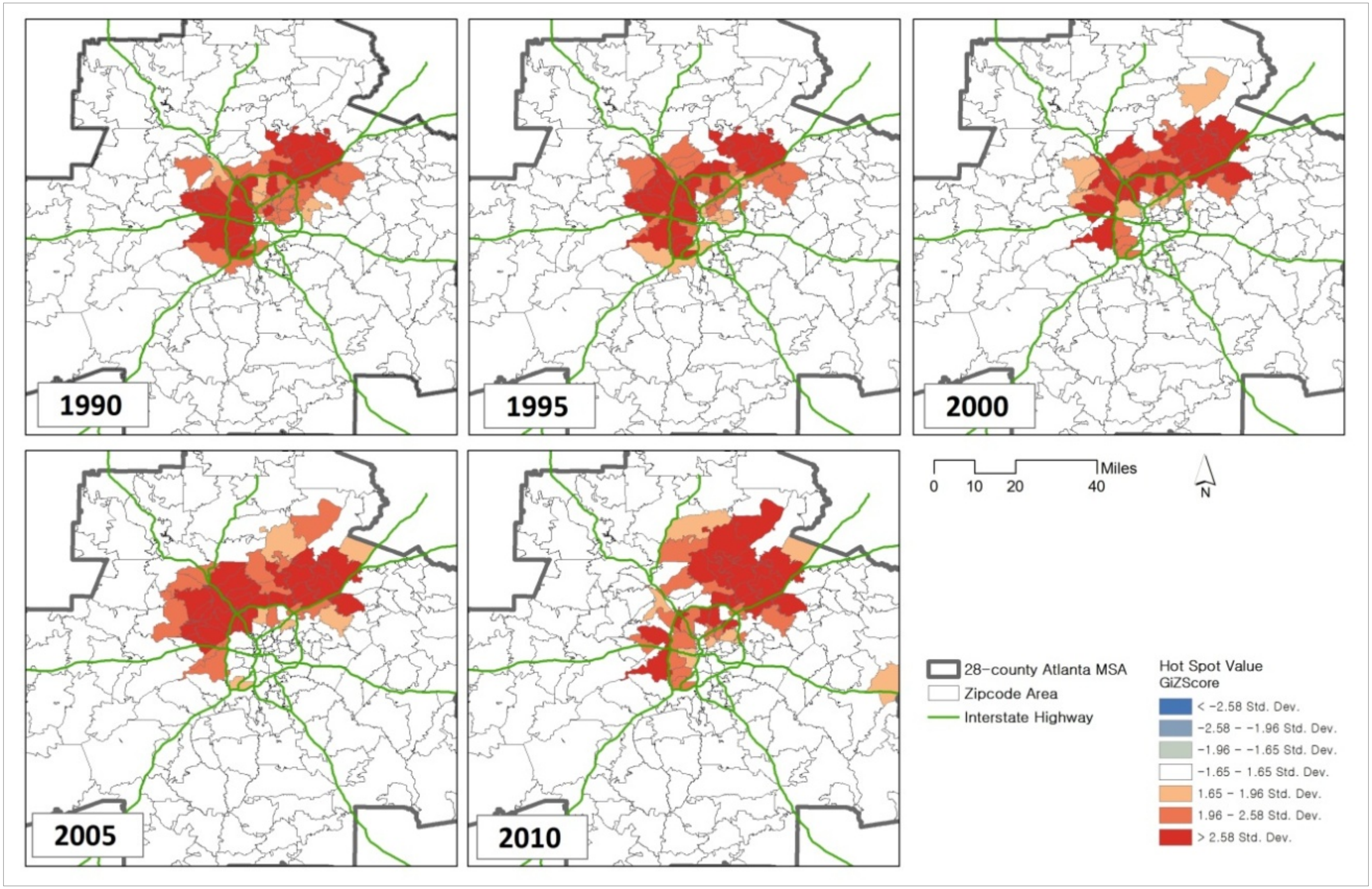

Figure 3.18. Hot Spot for Domestic Manufacturing Employment in the 28-county Atlanta MSA, 1990-2010

3.4.3. Intra-metropolitan Spatial Differentiation between High-tech and Non-high-tech Manufacturing FDI

This study measures whether differences in spatial distribution exist between foreign and domestic high-tech and non-high-tech manufacturing within the 28-county Atlanta MSA over time. As shown in Figure 3.19, job growth in the high-tech manufacturing FDI sector primarily took place in the northern part of the metropolitan area and not the southern part. In particular, the study identifies the suburbs of Gwinnett, Cobb and Fulton Counties as an emerging job cluster of high-tech manufacturing FDI, and this job cluster has remained strong over the past two decades. While the 28-county Atlanta MSA lost about 1,500 jobs in the high-tech manufacturing FDI sector between 1990 and 2010, Gwinnett, Cobb and Fulton Counties gained nearly 4,000 high-tech jobs in foreign manufacturing firms. The maps in Figure 3.21 demonstrate the spatial concentration of high-tech manufacturing FDI in the northern part of the metropolitan area. The chart reflects mean center and standard deviation ellipse as computed for high-tech manufacturing FDI for the years of 1990 and 2010. The mean center moved northeastward, and the ellipse for 2010 is smaller than that for 1990. This analysis demonstrates that suburbanization of high-tech manufacturing FDI jobs has occurred and that the spatial concentration of the jobs around the northern part of the metropolitan area only increased over time.

The spatial pattern of non-high-tech manufacturing FDI is slightly different. As shown in the maps in Figure 3.21, the mean center for the sector has not changed significantly, but the standard deviation ellipse became larger from 1990 to 2010. This result indicates that non-high-tech manufacturing FDI is more spatially dispersed than high-tech manufacturing FDI.

The study revealed a similar pattern for domestic high-tech and non-high-tech manufacturing employment. Jobs in domestic manufacturing firms moved outward into the northern sections of the metropolitan area, especially in Gwinnett, Cobb, and north Fulton Counties (See Figure 3.20). Nevertheless, the central metropolitan areas still have a substantial number of domestic manufacturing jobs, although manufacturing FDI jobs moved away from those areas.

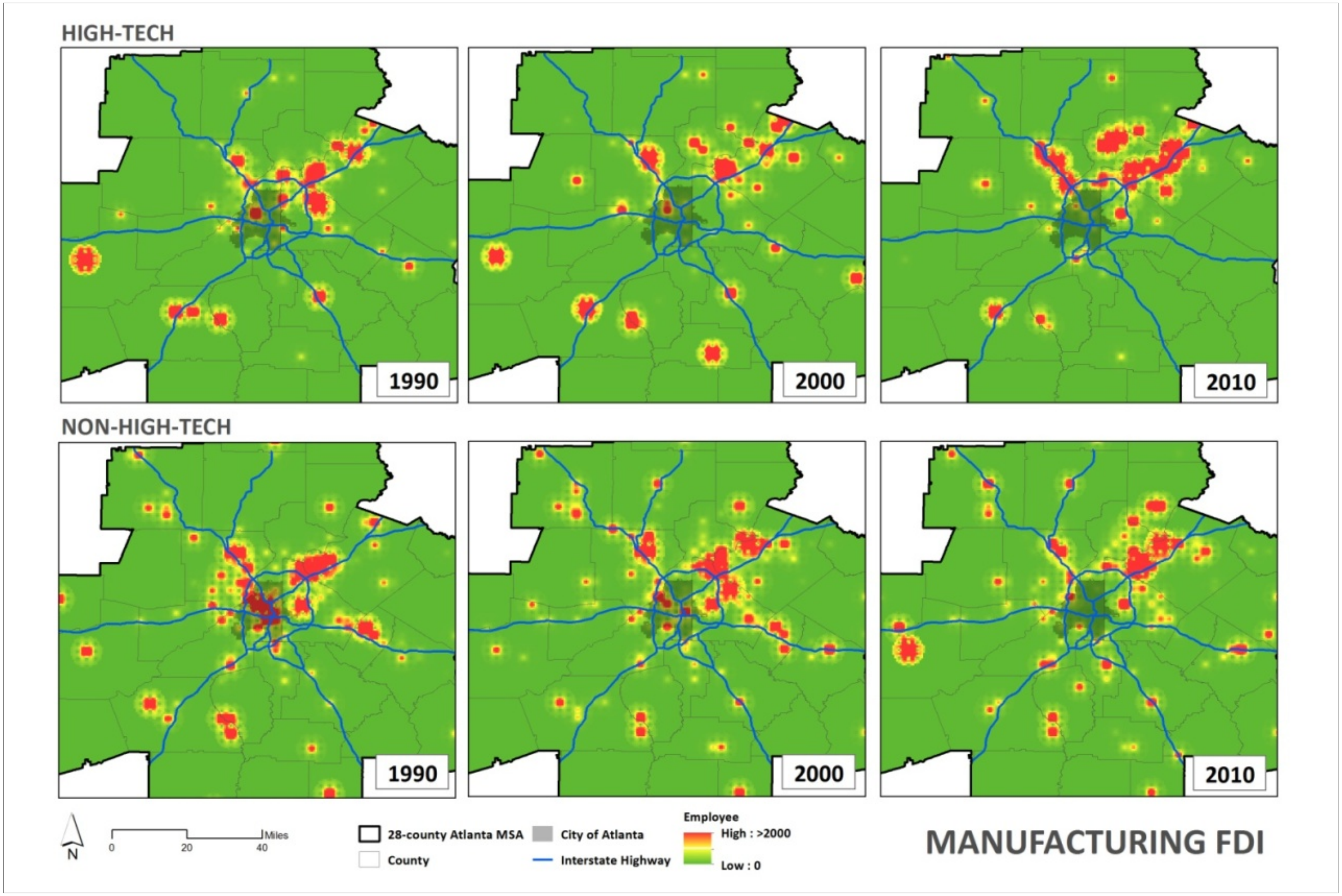

Figure 3.19. Location of High-tech and Non-high-tech Manufacturing FDI in the 28-county Atlanta MSA, 1990-2010

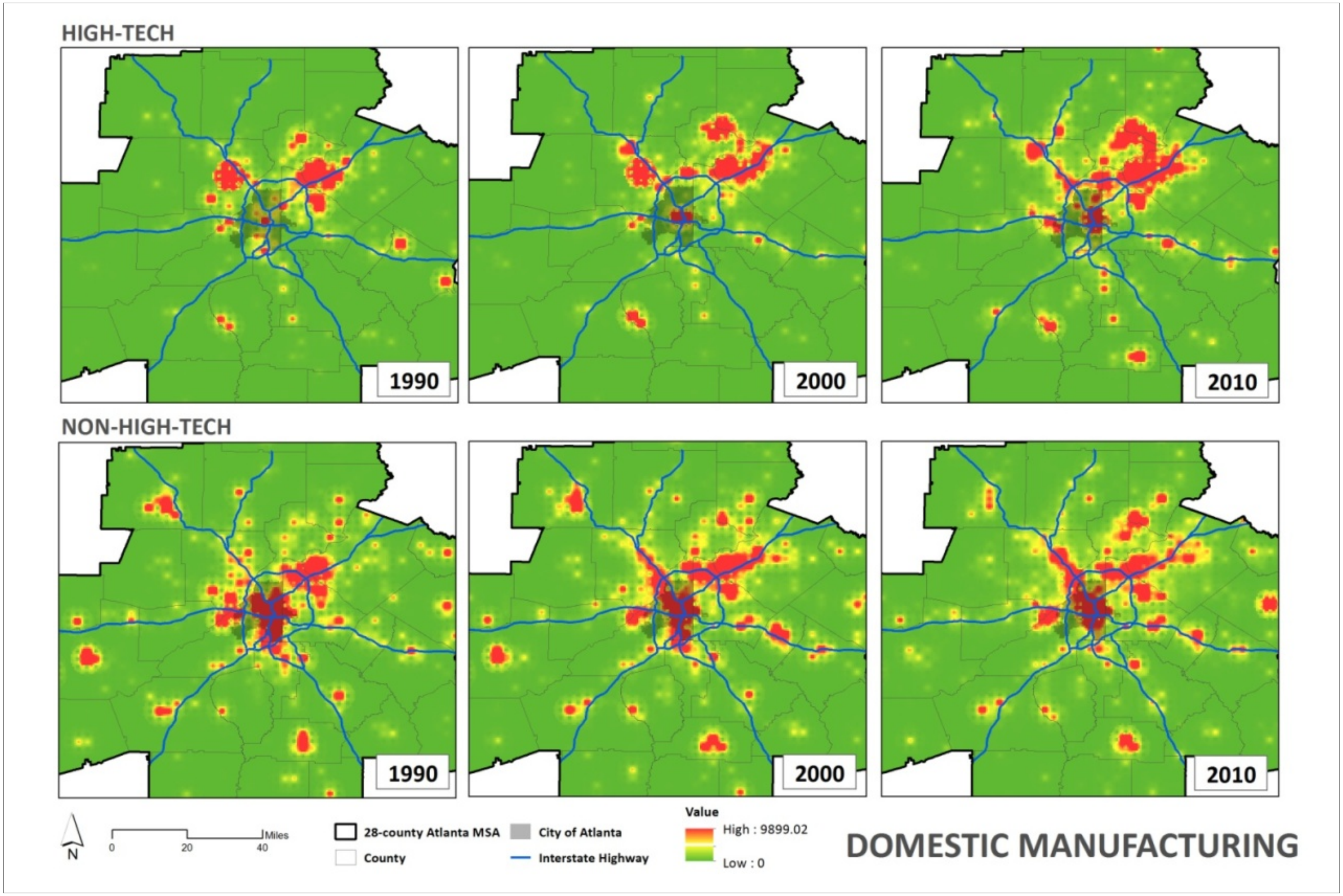

Figure 3.20. Location of Domestic High-tech and Non-high-tech Manufacturing in the 28-county Atlanta MSA, 1990-2010

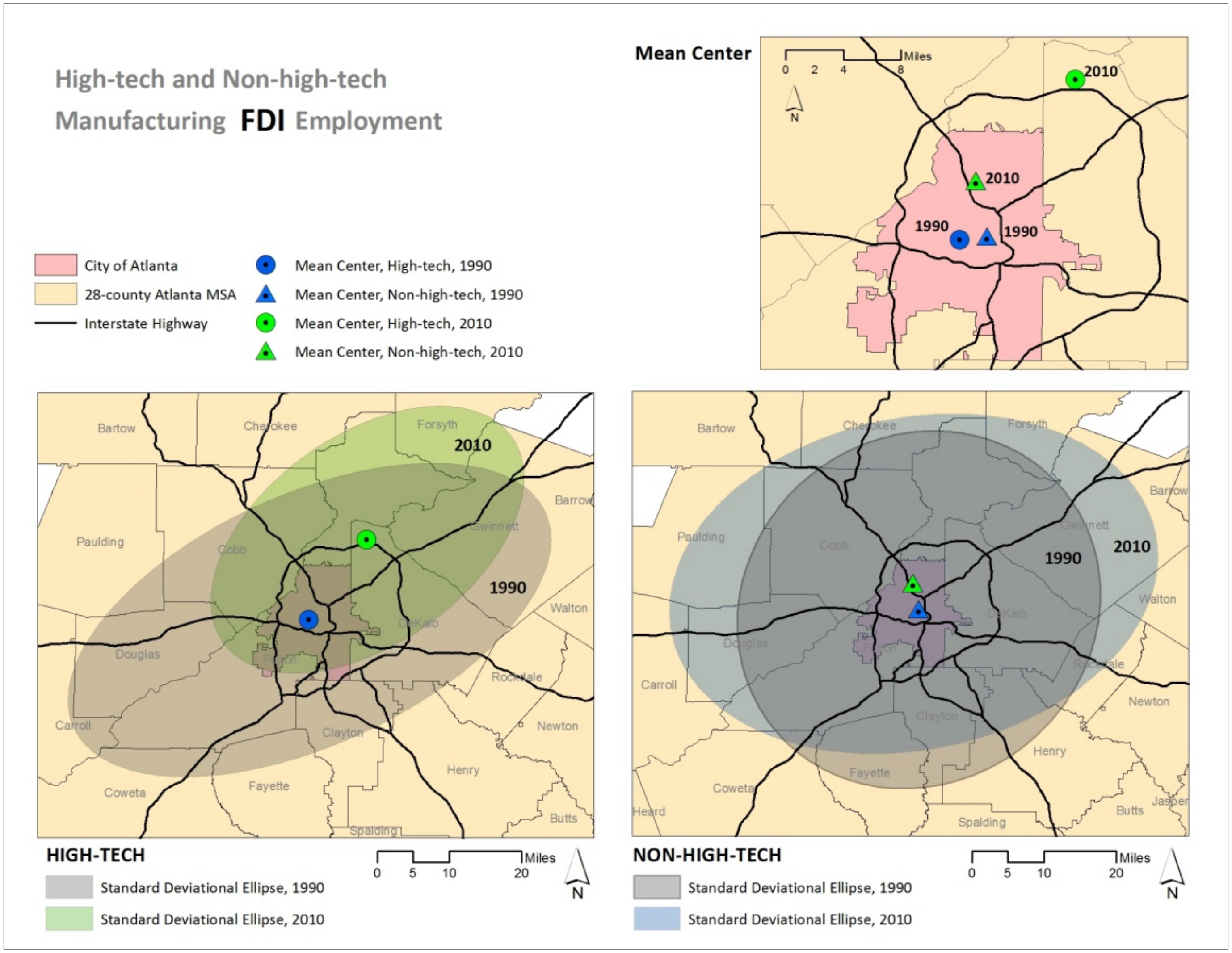

Figure 3.21. Change of Mean Center and Standard Deviational Ellipse of High-tech and Non-high-tech Manufacturing FDI Employment in the 28-countyAtlanta MSA, 1990-2010

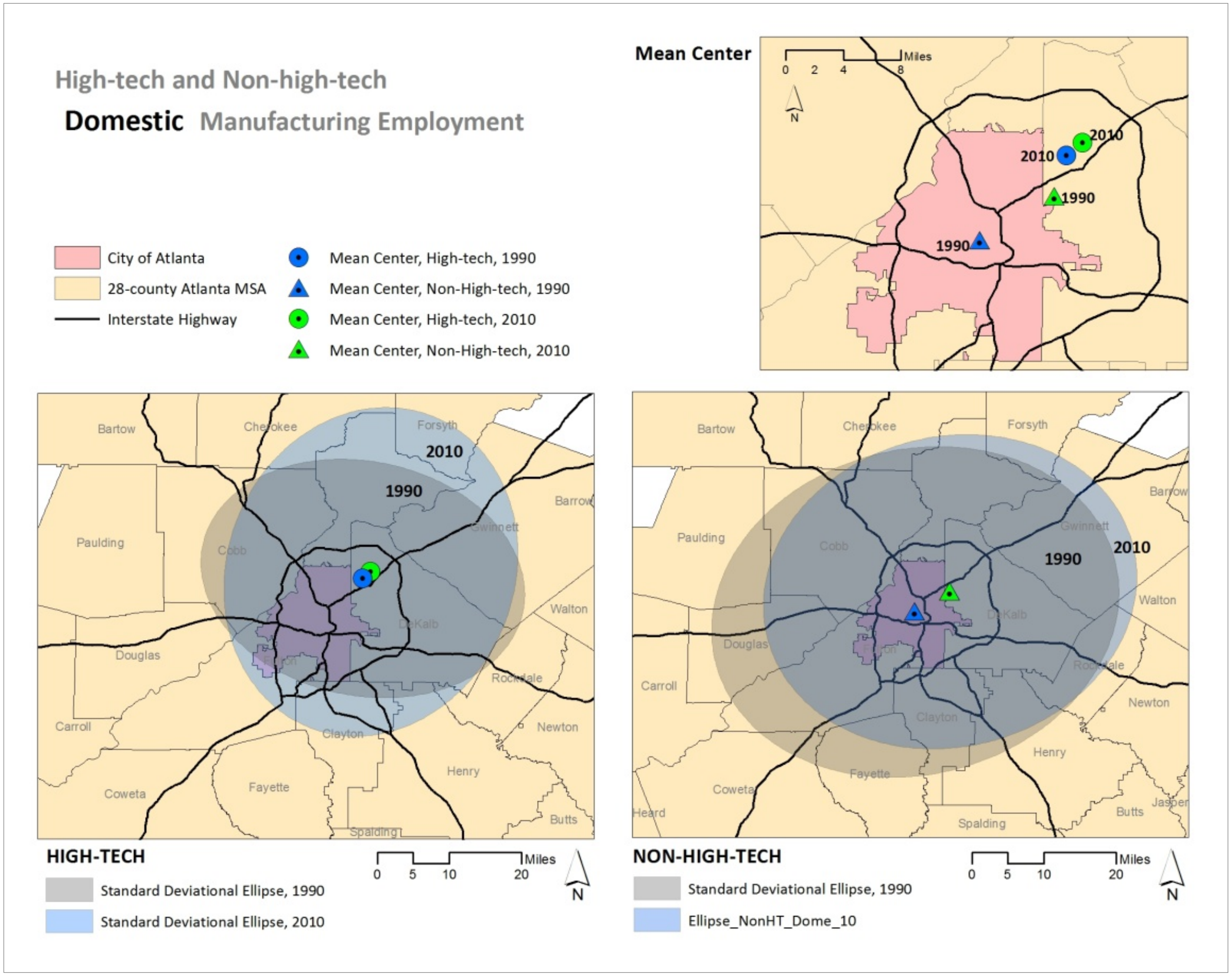

Figure 3.22. Change of Mean Center and Standard Deviational Ellipse of Domestic High-tech and Non-high-tech Manufacturing Employment in the 28-countyAtlanta MSA, 1990-2010

4. INTRA-REGIONAL LOCATIONAL FACTORS OF FDI

4.1. Hypotheses, Methods, and Variables

4.1.1. Intra-state Locational Factors Models

Hypotheses

The research tests several hypotheses relating to the second research objective– identifying the role of locational factors in determining intra-regional spatial patterns of manufacturing FDI over time. If the ESDA demonstrates a spatial concentration of manufacturing FDI in metropolitan areas over time, a question arises as to the identity of the significant factors that contribute to the foreign manufacturer's decision to locate in these areas.

While classical locational theory emphasized access to markets, labor, raw materials, and transportation cost as the dominant factors in a firm's location decision (Christaller, 1933; Hotelling, 1929; Losch, 1954; Weber, 1929), recent studies have extended the focus to include factors such as labor skills and productivity, agglomeration economies, government and business climate, and infrastructure (Arsen, 1997; Bartik, 1985, 1988; Dissart & Deller, 2000; Gottlieb, 1995; Klier, 2006; Love & Crompton, 1999; Porter, 1998). The literature on locational factors of FDI has provided generally similar findings indicating that foreign investors would focus on market size, labor market, unionization rate, state taxes, and infrastructure (Coughlin et al., 1991; Head et al., 1999; Smith & Florida, 1994; Woodward, 1992). Although locational factors may differ between inter-region selection, when firms are seeking a state or a region in which to locate, and intra-regional selection of a specific site or community within a region (Blair

& Premus, 1987), very few studies have identified locational factors of FDI that may have significant intra-regional variation.

Given intra-regional level locational factor analysis, this study assumes that a county with many critical micro-geographic features–such as a pool of skilled labor, more industrial sites, good transportation systems, lower taxes, government incentives, and good education–would be a desirable location for manufacturing FDI. In addition, the research pays particular attention to whether and why foreign manufacturers tend to cluster in metropolitan areas or non-metropolitan areas. It assumes that the metropolitan areas, especially a large metropolitan area, would attract a great deal of manufacturing FDI, since these areas are associated with positive external economies and/or agglomeration.

Marshall ([1860] 1961) proposed “external” scale economies as an important concept in understanding the spatial proximity of firms. External scale economies can provide production-cost savings that result from increases in industry-wide output within a given region. The locational advantages of central cities or metropolitan areas arise from two different categories of agglomeration economies: (1) localization economies, which are external to the individual firm and arise from the size of the local industry, and (2) urbanization economies, which are external to the local industry and arise from the size of the local economy (Hoover, 1937). Jacobs (1969) pointed that knowledge spillover in generating growth might occur between, rather than within, industries. However, Glaeser et al. (1992) explained that the Marshall-Arrow-Romer externalities that exist in a large metropolitan city(region) also have agglomeration economies that occur between firms in the same industry.

Paul Krugman's "core-periphery" model emphasized the spatial agglomeration and tangible causes of the spatial concentration of economic activities by emphasizing the three-way interaction among increasing returns, transportation costs, and the movement of productive factors (Krugman, 1993). Spatial concentrations of industry and population occurred predominately within a core region, which can be a large central city or metropolitan area. The existence of agglomeration economies can attract substantial migration from peripheral regions and bring enhanced industrial competitiveness, attracting outside direct investment and diversifying exports. Further, core regions better accommodate the need of high-tech industries to cope with global competition. Large numbers of higher wage-seeking skilled labor from non-core regions serve to diversify the labor force. The benefits of population agglomeration–including the development of improved infrastructure, transportation, communication, and knowledge, as well as production input sharing–affected all industries due to their proximity (Krugman, 1993).

Similarly, several studies on the location of high-tech industry demonstrated that most high or advanced technology industry firms prefer to locate their establishments within, or as close as possible to, metropolitan areas (Arauzo-Carod & Viladecans-Marsal, 2009; DeVol, 1999; Haug, 1991; Helper et al., 2012a; Kimelberg & Nicoll, 2012). These locational preferences are mainly associated with the greater advantages of agglomeration in metropolitan areas, including a pool of skilled labor, specialized input in the form of local goods and services suppliers, and knowledge spillover. High-tech firms, in particular, typically have unique labor requirements (i.e., highly educated and trained scientists and engineers), and thus the presence of the skilled workforce common in metropolitan areas can attract more of those industries (DeVol, 1999; Kimelberg & Nicoll, 2012).

Figure 4.1 shows the employment by high-tech manufacturing firms[4] in Georgia by type (domestic vs. foreign) and the share of employment by each type between 1990 and 2010. Domestic high-tech manufacturing firms employed more than 80,000 workers in Georgia in 1990, and this employment increased by 2002. However, a significant job loss occurred in the domestic high-tech manufacturing sector from 2003 to 2010. In comparison, employment in foreign high-tech manufacturing firms remained stable over this period. Foreign manufacturers have steadily provided more than 20,000 jobs in high-tech sector.

The percentage of all Georgia domestic manufacturing employment represented by domestic high-tech manufacturing employment has generally increased over the past two decades. Despite the decrease of employment in domestic high-tech manufacturing (602,214 in 1990 vs. 459,161in 2010), the share of jobs in domestic manufacturing employment has increased from 14.1 percent in 1990 to 16.9 percent in 2010. In contrast, the share of foreign high-tech manufacturing employment was more than 30 percent of all foreign manufacturing employment, with the exception of a few years. Thus, a significant portion of jobs offered by foreign manufacturers has been in the high-tech

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[4] The definition of high-tech manufacturing for this study is taken from Bureau of Labor Statistics (BLS) economist Daniel Heckler (2005) report, which is based on the proportion of employment of science, engineering, and technician occupations in an industry. The report defines high-tech industries as those industries with a concentration of science, engineering and technician occupations that is at least 2 times the average for all industries. High-tech industries meeting that criterion are then broken out into three levels. See Appendix A for summary of each level of high-tech industry and employment.

sector, and these firms accordingly may prefer to locate their establishments within metropolitan areas.

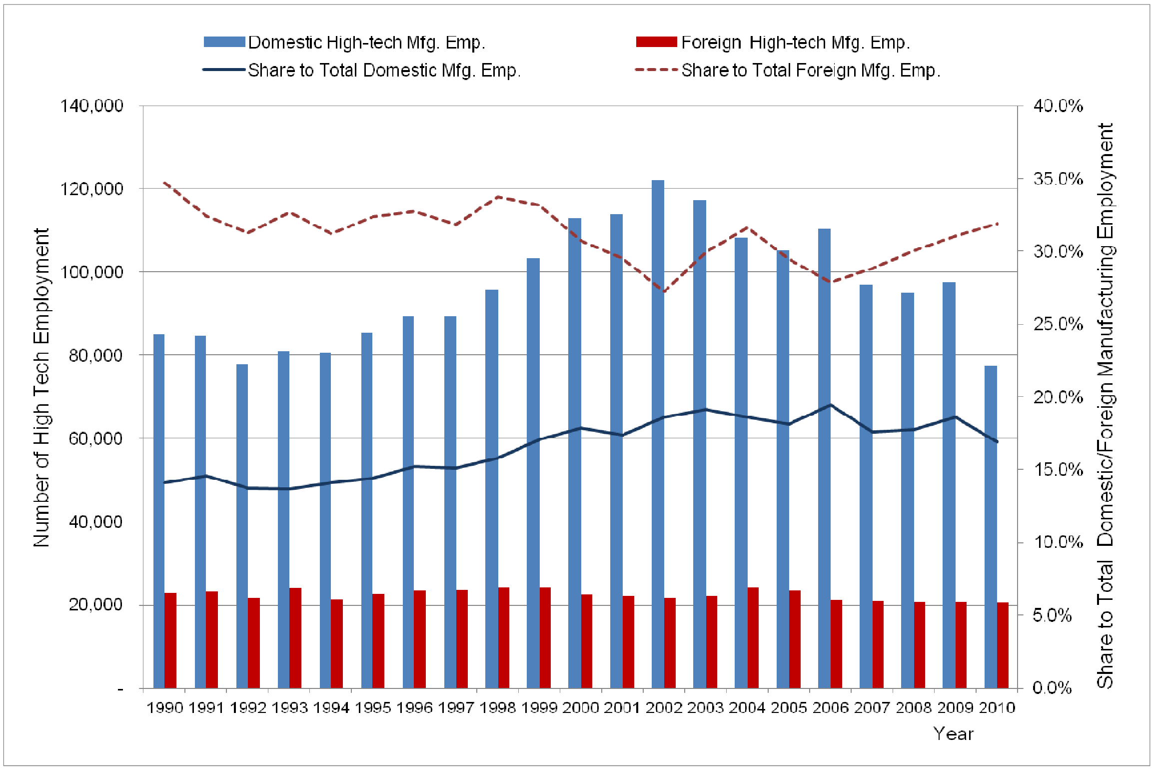

Figure 4.1. High-tech Manufacturing Employment in Georgia by Type
Source: Author's calculations based on the NETS dataset

This study assumes, therefore, that a county with better location-specific advantages attracted more manufacturing FDI in Georgia from 1990 to 2010. In particular, the presence of agglomeration economies in metropolitan areas, especially in a large metropolitan area, positively influenced the location of manufacturing FDI from 1990 to 2010.

The next hypothesis seeks to identify differences in locational factors between foreign and domestic manufacturers. While no empirical findings exist on intra-regional locational factor comparisons between foreign and domestic manufacturers, this study assumes that the higher percentage of foreign manufacturing employment in high-tech industry sectors causes different locational preferences compared to domestic manufacturers.

Methods

Unlike most studies on industrial location of FDI in the U.S. using cross-sectional data, this study is based on micro-longitudinal data representing establishment-level employment and location over time. This study establishes a panel data regression model to test and analyze the main factors influencing location selection by foreign manufacturers in Georgia for the years 1990-2010 by focusing on a county-level comparison.

The study's model presents several advantages.[5] First, the panel data model can control for unobserved heterogeneity among counties. Many county-specific variables affect a foreign manufacturer's decision to locate in a specific area, but some of these variables are difficult to measure or hard to obtain so that not all variables are available for inclusion in the locational factors model. The omitted variables are systematically correlated with the explanatory variables, which leads to bias in the resulting estimates. Panel data can control for such unobserved county heterogeneity whereas a cross-section analysis or a time-series analysis cannot.

Second, the panel data model increases sample sizes. The model is useful for data collected for the same individuals, firms, states, or counties at multiple times (e.g., over a

[5] For a more detailed analysis of the advantages of panel data, see Baltagi, B.H. (2008). *Econometric analysis of panel data* (4th ed.): John Wiley & Sons Ltd. pp. 6-11.

series of years). For the model examining the correlation between urban industrial land loss and the suburbanization of FDI in manufacturing jobs, for instance, industrial land area data is available only for 20 counties in the Atlanta metropolitan area. However, this data was collected annually (with some exceptions) from 1999 to 2010. Obviously, a panel data set collected over such a long time period provides a rich source of information, which in this instance, includes 198 effective observations (13 counties * 12 years + 7 counties * 6 years).

The study considers the following locational factor equation with the panel regression model:

$$ln\, E_{it} = \alpha_0 + \beta_1 AGGL_{it} + \beta_2 LABOR_{it} + \beta_3 LAND_{it} + \beta_4 ACCESS_{it}$$
$$+\beta_5 GOV_{it} + \beta_6 RACE_{it} + \beta_7 MSA_i + \beta_8 RECES_t + u_{it},$$

where E_{it} denotes the total number of employees in manufacturing FDI for county i in year t and $AGGL_{it}$ represents county i's agglomeration economies in year t. $LABOR_{it}$ is county i's labor market condition, and $ACCESS_{it}$ is accessibility and transportation conditions in year t. $RACE_{it}$ is included to explore whether manufacturing FDI has racial preferences. MSA_i is for dummy variables of metropolitan statistical area status, and $RECES_t$ includes time dummy variables, such as the periods of recession. The designation u_{it} represents an error term. The following section discusses independent variables in each category.

Table 4.1. Summary of Research on Location of FDI

	Inter-regional								Intra-regional		
	Couglin, Terza & Arrondee (1991)	Friedman, Gerlowski & Silberman (1992)	Woodward (1992)	Smith & Florida (1994)	Head, Ries & Swenson (1999)	Coughlin & Segev (2000)	Kim, Pickton & Gerking (2003)	Kandogan (2012)	Wu (2000)	List (2001)	Wei, Luo & Zhou (2010)
Study Area	50 States, US	48 States, US	50 States, US	US	50 States, US	48 States, US	48 States, US	US	Guangzhou, China	California, US	Nanjing, China
Geographic Units	State	State	State & County	County	State	County	State	State	Postal Zone	County	Sub-district
Time Period	1981-1983	1977-1988	1980-1989	?	1980-1992	1989-1994	1987-1994	2006	1981-1991	1983-1992	2000
Type of FDI	All Types	New Plants	New Plants	All Types & New Plants	New Plants	New Plants	New Plants	All Types	All Types	New Plants	All Types
Source Country	All Countries	All Countries, Japan, Europe	Japan	Japan	Japan	All Countries	All Countries	All Countries	All Countries	All Countries	All Countries
Industry	All Manufacturing	All Manufacturing	All Manufacturing	Automotive-relative Manufacturing	All Manufacturing	All Manufacturing	All Manufacturing	All Industries	All Industries	Manufacturing	Manufacturing
Method	Conditional Logit Model	Conditional Logit Model	Conditional Logit Model	Tobit, Poisson & Negative Binomial	Conditional Logit Model	Negative binomial model	Conditional Logit Model	OLS	Logistic Regression	Two-Step Modified Count Data Model	OLS
Dependent Variable	Number of Plants	Number of Plants	Number of Plants	Number of Plants	Number of Plants	Number of Plants	Number of Plants	- FDI Stock - FDI Employees	Number of Plants	Number of Plants	- Contracted Investment - FDI Employees

Table 4.2. Summary of Independent Variables in Research on Location of FDI

Category	Independent Variable	Inter-regional									Intra-regional		
		Couglin, Terza & Arrondee (1991)	Friedman, Gerlowski & Silberman (1992)	Woodward (1992)		Smith & Florida (1994)	Head, Ries & Swenson (1999)	Coughlin & Segev (2000)	Kim, Pickton & Gerking (2003)	Kandogan (2012)	Wu (2000)	List (2001)	Wei, Luo & Zhou (2010)
		State	State	State	County	County	State	County	State	State	Postal zone	County	Sub-district
Market	Population					+				+			
	State Income	+	+	+			∆	+	–	∆			
	Adjacent State Income						+						
	Port		+						+				
Labor Market	Unemployment Rate	+	+		–		∆	∆	∆	+			
	Manufacturing Wage	–	–		∆	+	+	+	–			–	
	Manufacturing Productivity		+		+			∆	∆				
	Education(high-school) Attainment				+	+		+					
	R&D Population Rate									∆			
	Unionization Rate	+	+	–		∆	–	∆	+	∆			
	Right-to-Work State						∆						
Land	Land Area	+	∆	+	+						∆	+	+
	Built Area										∆		
	Industrial Land Area										∆		+
	Vacant Land Area												
Accessibility & Transportation	Access to CBD										+/–		+
	Access to Hotel										+		
	Highway	+			+	+		+		∆	+		∆
	Railroad	+								∆	+		∆
	Airport	+								∆			+
	Port										+		+
Tax & Government Promotion	State & Local Taxes	∆	–			∆		–					
	Unitary Tax	∆	∆	–			–		∆				
	Corporation Tax		∆	∆			–		+				
	Property Tax				∆			∆				∆	
	Business Tax Climate Index									∆			
	State Promotional Expenditure	+	+						+				

+: positive and significant, –: negative and significant, ∆:included but not significant, O: included

Table 4.2. Summary of Independent Variables in Research on Location of FDI (Cont.)

Category	Independent Variable	Inter-regional									Intra-regional		
		Couglin, Terza & Arrondee (1991)	Friedman, Gerlowski& Silberman (1992)	Woodward (1992)		Smith & Florida (1994)	Head, Ries & Swenson (1999)	Coughlin & Segev (2000)	Kim, Pickton & Gerking (2003)	Kandogan (2012)	Wu (2000)	List (2001)	Wei, Luo & Zhou (2010)
		State	State	State	County	County	State	County	State	State	Postal zone	County	Sub-district
Tax & Government Promotion	Unemployment Benefits			Δ									
	State Industrial Program			Δ									
	Labor Subsidy						+						
	Capital Subsidy						Δ						
	Foreign Trade Zone						+				+		+
	Foreign Office/Employment			+			Δ	Δ					
Agglomeration Economies	Population Density				+	Δ		Δ	–		+/–	+	Δ
	Manufacturing Density	+			+	+		+	–				
	Existing FDI Density						+					+	
	US Industry Density						+			+			
Racial Density	Black Density				–			Δ					
	Asian Density												
	Non-white Density					+							
	Poverty Rate				–								
	Non-poor Black Density				Δ								
Environment / Quality of Life	Anti-pollution Expenditure/Law		Δ						Δ	Δ		Δ	
	Climate				Δ			Δ		Δ			
	Crime Rate									Δ			
Region	Census Regions				O								
	BEA Regions						O	O					
	Coastal Regions							O					
	Metropolitan Areas							O					
	Urbanized Areas							O					O
Time Period	Recession												

+: positive and significant, –: negative and significant, Δ:included but not significant, O: included

Variables

The dependent variable in the panel data models is the total number of employees in manufacturing FDI in a given county for a specific year. The National Establishment Time Series (NETS) dataset provides longitudinal establishment-level employments for each foreign manufacturer. Thus, the models aggregate these employments into each of the state's 159 counties for each year from 1990-2010. The dependent variable is log transformed.[6]

The study chose these independent variables based upon the findings of some recent and/or widely cited studies. Much of the literature related to the location of FDI has focused on differences across state (or regional) boundaries and has emphasized the importance of locational factors such as market size, labor market, unionization rate, state taxes, and other features in selecting a state or a region (Coughlin & Segev, 2000; Coughlin et al., 1991; J. Friedman et al., 1992; Head et al., 1999; Kandogan, 2012; Kim et al., 2003; Smith & Florida, 1994; Woodward, 1992). Table 4.1 provides a summary of previous studies related to the locations of FDI. Table 4.2 shows independent variables included in those studies and their results.

Given the intra-regional level analysis, however, some factors may not result in a significant difference among counties relating to their effects on the location of FDI. For example, several studies suggested foreign manufacturing establishments prefer locations

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[6] While there are 111 counties in Georgia that had at least one manufacturing FDI employment, the other 48 counties had no employment between 1990 and 2010. The study includes all 159 counties in the panel models after log(x+1) transformation. To check the sensitivity of the models, it estimates coefficients of the intra-state locational factors model with only 111 counties (groups) for the same periods. The results show the coefficients do not change much and there are no reverse signs.

with a union-free environment, lower state taxes, and huge government promotional expenditures (Coughlin & Segev, 2000; Head et al., 1999; Kim et al., 2003; Woodward, 1992), but these factors may not vary within the state (or region). Rather, this study selects several types of independent variables that represent the location-specific advantages of each county at the intra-regional level, as identified through literature review and data availability. The study examines eight categories of variables: agglomeration, labor market, land, accessibility and transportation, taxes and government promotion, racial density, MSA, and recession. Table 4.3 displays eighteen explanatory variables in these categories.

<u>Agglomeration Economies</u>: Several empirical studies found positive and statistical significance in localization economies, measured by manufacturing density, in manufacturing FDI (Coughlin & Segev, 2000; Coughlin et al., 1991; Smith & Florida, 1994; Woodward, 1992). Woodward (1992) and List (2001) found that population density as a proxy for urbanization economies was a positively significant determinant of manufacturing FDI, while Kim et al. (2003) found a negative relationship between population density and the location of manufacturing FDI.

This study considers two categories of agglomeration economies, measuring localization economies by total manufacturing employees in a given county and urbanization economies by county total population per square mile of land area. This study expects these two variables to have a positive determinant to the location of manufacturing FDI.

Labor Market: Labor market conditions such as unemployment rate, wage rate, labor productivity, education attainment, and unionization rate are the central elements in the industrial location process. Although the unionization rate is an important factor for foreign manufacturers looking for locations, empirical studies on the effectiveness of unionization is somewhat ambiguous. While the conventional view was that higher levels of unionization in a state deter FDI (Head et al., 1999; Woodward, 1992), some studies found positive and statistically significant effects of unionization (Coughlin et al., 1991; J. Friedman et al., 1992; Kim et al., 2003). However, this study excludes this factor because it is not available at a sub-state level. To capture local labor market differentials within the state, the study selected three variables: unemployment rate, high school degree rates, and bachelor degree rates.

This study explores the importance of the unemployment rate in a county, which could be an indicator of labor availability. Several studies found that higher unemployment rates are positively related to FDI at the inter-state level (Coughlin et al., 1991; J. Friedman et al., 1992; Kandogan, 2012). With inter-county level regressions, however, Woodward (1992) suggested a contrasting view of the effectiveness of the unemployment rate in attracting FDI. He claimed that Japanese manufacturers seek to avoid counties with higher unemployment rates because they viewed the areas as offering less-competitive industrial conditions and a lower quality of life. The literature suggested that the unemployment rate reflects a pool of potential workers but factors underlying the higher rates could deter FDI at the intra-regional level. Thus, the likely empirical association between unemployment rates and manufacturing FDI across counties within a state is uncertain.

Education attainment is another important characteristic of labor market conditions. It could be an indicator of the quality of the labor force. Moreover, education attainment varies considerably within a state and becomes a more important factor in determining where a firm seeks a specific site or community (Blair & Premus, 1987; Woodward, 1992). Empirical literature suggested that education attainment is a positive and statistically significant determinant of FDI (Coughlin & Segev, 2000; Smith & Florida, 1994; Woodward, 1992). For the level of educational attainment, this study uses two variables: 1) high school–measured by the percentage of the county total of working age adults (25 and over) who graduate from high school or attend some college; and 2) bachelor degree–measured by the percentage of the county total of working age adults who have a bachelor degree or higher. This study expects that these two variables are positively related to manufacturing FDI.

<u>Land</u>: Land availability and costs also are important factors affecting industrial location choice of FDI. Land area can serve as a proxy for the number of potential sites. Several studies used land area to test Bartik (1985)'s "dartboard theory" of industrial location with respect to FDI, and found that larger states (or counties) attract more FDI than smaller states (or counties), *ceteris paribus* (Coughlin et al., 1991; List, 2001; Woodward, 1992). This study expects that a larger county will attract more FDI than a smaller county.

<u>Accessibility & Transportation</u>: The role of transportation on industrial site selection matters in the local decision. The existence of a highly developed transportation network in a particular county would ensure greater accessibility to regional and national markets.

Several studies have presented empirical support for the importance of various transportation modes, such as highway, railway, airport, and port, in the location of FDI (Coughlin & Segev, 2000; Coughlin et al., 1991; Smith & Florida, 1994; Wei, Luo, & Zhou, 2010; Woodward, 1992; Wu, 2000). In addition, access to international airports and seaports becomes an increasingly important link to global markets. In contrast, some studies on intra-regional location of FDI in China indicated the significance of accessibility to the central business district (CBD) (Wei et al., 2010; Wu, 2000).

To capture the accessibility of an existing transportation network and the CBD, the study includes five variables to indicate the accessibility of each county: distances to a highway, railway, international airport, seaport, and the CBD. While most studies use the Euclidian distance, this does not provide an "on-the-ground," realistic estimation of actual distance as determined by the availability of the existing transportation infrastructure. Thus, this study uses GIS-based network analysis to calculate the real distance between the center of each county and the nearest highway, international airport, and seaport, respectively, as well as the CBD (principal city in MSA). The only exception is railway accessibility. Because no information exists regarding the location of railway stations, the research calculates the total length of railway in each county.

<u>Taxes & Government Promotion</u>: Given the intra-regional level, government incentives and programs may not result in a significant difference among counties relating to the effect of incentives on the location of FDI. However, this study uses investment zone-based programs like Foreign Trade Zone to measure the effect of government policy on the location of FDI.

This study also includes property taxes to measure the effectiveness of local taxes as a deterrent to manufacturing FDI. Conventional wisdom suggested that property taxes are a very important intra-regional locational factor (Blair & Premus, 1987). However, several empirical studies did not find property taxes to be a statistically significant determinant of FDI location (Coughlin & Segev, 2000; List, 2001; Woodward, 1992). Nonetheless, this study expects property taxes, measured by county tax digest millage rates, to relate negatively to manufacturing FDI.

Racial Density: Some researchers explored whether manufacturing FDI has racial preferences, but the results were mixed. Woodward (1992) found that Japanese manufacturers tend to avoid counties with high Black population density. On the other hand, Smith and Florida (1994) found that Japanese automotive-related manufacturers prefer locations with a higher percentage of non-white population. Thirty-three percent of Georgia's total population was Black in 2010, and the state ranked third in the U. S. in this category. This study includes the percentage of Black population in each county, but the relationship between Black population density and location of manufacturing FDI is uncertain.

In addition, this study includes an Asian density variable, measured by the percentage of the county population represented by Asians. The spatial pattern analysis for manufacturing FDI in Chapter 3 shows a strong concentration of manufacturing FDI in counties with higher Asian population density. In particular, the study identifies the suburbs of Gwinnett, Cobb, and Fulton Counties in the Atlanta metropolitan area as an emerging job cluster of high-tech manufacturing FDI. This study statistically tests whether Asian density has a significant effect on the location of manufacturing FDI.

Others: This study considers two dummy variables to explore the possibility that foreign manufacturers have specific preferences for metropolitan areas and a very large metropolitan area. The study gives the first dummy variable (ATLMSA) a value of one if the county is in the 28-county Atlanta MSA, and a value of zero otherwise. The study defines the second dummy variable (SMALLMSA) as counties in the metropolitan statistical area but not in the Atlanta MSA.

The panel model in this study includes a dummy variable that represents the period of the recession in the early 2000s and the period of the great recession in 2007 to measure how much these recessions have affected the employment and location of FDI.

Table 4.3. Independent Variables for Intra-state Locational Factors Models

Category	Variable	Definition	Data Source	Time	Expected sign	Lag
Agglomer-ation	POPDEN	Natural logarithm of population per square mile of land area	Population Estimates: County Intercensal Estimates, US Census Bureau	1990 – 2009	+	One year
	MFGEMP	Natural logarithm of county total manufacturing sector employees	NETS dataset	1990 – 2009	+	One year
Labor Market	UNEMP	County annual unemployment rate	Labor Force Employment and Unemployment, Georgia LaborMarket Explorer	1990 – 2009	?	One year
	HIGHSCHOOL	Percentage of county total working age adults (25 and over) who graduated from high school or some colleges	Census Bureau, 1990, 2000 Censuses of Population, and the 2006-2010 American Community Survey	1990 – 2009	+	
	BACHELOR	Percentage of county total working age adults (25 and over) who have bachelor degree or higher	Census Bureau, 1990, 2000 Censuses of Population, and the 2006-2010 American Community Survey	1990 – 2009	+	
Land	LANDAREA	Natural logarithm of county land area (in square miles)	Bureau of Census		+	
Access-ibility & Transp-ortation	CBD	Natural logarithm of network distance (in miles) between a county centroid and the nearest principal cities	GIS network analysis with National Transportation Atlas Database 2010		-	
	HIGHWAY	Natural logarithm of network distance (in miles) between a county centroid and the nearest interstate highway	GIS network analysis with National Transportation Atlas Database 2010		-	
	RAILWAY	Natural logarithm of total length (in miles) of county railway	GIS analysis with National Transportation Atlas Database 2010		+	
	AIRPORT	Natural logarithm of network distance (in miles) between a county centroid and Atlanta international airport	GIS network analysis with National Transportation Atlas Database 2010		-	
	SEAPORT	Natural logarithm of network distance (in miles) between a county centroid and the nearest seaport	GIS network analysis with National Transportation Atlas Database 2010		-	

Table 4.3. Independent Variables for Intra-state Locational Factor Models (Cont.)

Category	Variable	Definition	Data Source	Time	Expected sign	Lag
Taxes & Gov. Promotion	PROTAX	County tax digest millage rates (0~100)	Annual Property Values data, Georgia Department of Revenue	1990 – 2009	-	One year
	FTZ (Dummy)	County included Foreign Trade Zone=1; other counties=0	List of FTZs, US Foreign-Trade Zones Board		+	
Racial Density	BLACKDEN	Percentage of county population that is Black	Population Estimates: County Intercensal Estimates, US Census Bureau	1990 – 2009	?	
	ASIANDEN	Percentage of county population that is Asian	Population Estimates: County Intercensal Estimates, US Census Bureau	1990 – 2009	?	
MSA	ATLMSA (Dummy)	28-County Atlanta metropolitan area=1; other counties=0	US Census Bureau		+	
	SMALLMSA (Dummy)	Counties in Metropolitan statistical areas, but not in Atlanta MSA=1; other counties=0	US Census Bureau		+	
Recession	RECESSION1 (Dummy)	Years after the early 2000s recession (2002<year<=2007) =1; other years=0			-	
	RECESSION2 (Dummy)	Years after the 2007 great recession (2007<year<=2010)=1; other years=0			-	

A potential "endogeneity" problem exists in the locational factor model. Many potentially important location determinants (independent variables), such as population density, manufacturing employment level, unemployment rate, and property taxes may be endogenously determined by a manufacturing FDI employment level (dependent variable). To deal with the endogeneity problem, some industrial location studies used instrumental variables that are correlated with endogenous independent variables but uncorrelated with unobserved factors affecting the dependent variable (Bartik, 1991). This study also considered the instrumental variables approach but found a lack of convincing instruments for each endogenous determinant. Rather, this study added a lagged endogenous variable to the locational factor model.

To examine intra-regional locational factors of FDI, this study compares various possible models including pooled OLS, fixed-effects models, random-effects models, and feasible generalized least squares (FGLS). The study conducts formal tests to examine the presence of fixed and/or random-effects in the panel data. Specifically, the study tests the fixed-effects by an F-test that contrasts the fixed-effects models with the pooled OLS to see how the fixed effect model can improve the goodness-of-fit. The study examines random-effects with (Breusch & Pagan, 1980)'s Lagrange multiplier (LM) test, which contrasts the random-effects model with the pooled OLS. As shown in the first rows of Table 4.4, the F-test statistic of 58.61 for the all FDI model is relatively big enough to reject the null hypothesis that all dummy coefficients are jointly equal to zero and thus suggests that the fixed-effects model is better than the pooled OLS. With a large chi-squared of 14267.30, the LM test for all FDI model leads to a strong rejection of the null hypothesis in favor of the random-effects model.

Next, the study conducts (Hausman, 1978)'s specification test to compare the random-effects model to its fixed counterpart. The test result for the all FDI model suggests no rejection of the null hypothesis that the individual effects are uncorrelated with the other regressors, and thus the random effect model is favored over its fixed counterpart. Similarly, the study conducts the F-test, the LM test, and the Hausman test for all other specific models including high-tech FDI, non-high-tech FDI, all Domestic, high-tech Domestic, and non-high-tech Domestic. As shown in Table 4.4, the results of these tests suggest that the random-effects model is the most appropriate test, compared to the fixed-effects and the pooled OLS.

Table 4.4. Tests for Fixed and Random-effects Panel Models

	Dependent Variable					
	All FDI	High-tech FDI	Non-high-tech FDI	All Domestic	High-tech Domestic	Non-high-tech Domestic
F-test for Fixed-effects	58.61***	55.40***	52.97***	8.95***	50.42***	14.50***
Breusch-Pagan LM Test for Random-effects	14267.30***	13919.95***	14090.27***	1323.33***	13578.80***	3461.06***
Hausman Test for Comparing Fixed and Random-effects	66.60***	70.9***	28.72***	154.38***	24.44***	109.82***

*** $p < 0.001$

However, the Modified Wald test and the Wooldridge test suggest that the panel data has both heteroskedasticity and serial correlation (See Table 4.5). To obtain more efficient estimators, this study conducts a Feasible Generalized Least Squares (FGLS) that allows relaxing heteroskedasticity and autocorrelation assumptions (Wooldridge, 2010).

Table 4.5. Tests for Heteroskedasticity and Autocorrelation

	Dependent Variable					
	All FDI	High-tech FDI	Non-high-tech FDI	All Domestic	High-tech Domestic	Non-high-tech Domestic
Wald test for heteroskedasticity	610000***	4700000***	1900000***	2493.56***	54140.08***	1974.14***
Wooldridge test for autocorrelation	347.37***	262.97***	417.48***	400.60***	215.61***	387.81***

*** $p < 0.001$

Table 4.6 shows the descriptive statistics of the 159-county Georgia panel dataset. For all variables except the one-year lagged independent variables, the study involves 3,339 county-year pair observations. The one-year lagged independent variables–such as POPDEN, MFGEMP, PROEMP, UNEMP, and PROTAX–use 3,180 ($159 \times (21-1)$) observations because the use of one-year lagging leads to a loss of the first year of data for each of the 159 counties. Table 4.6 lists three different types of statistics: overall, between, and within. “Overall” statistics are ordinary statistics based on 3,339 (or 3,180) observations. “Between” statistics are calculated across the 159 counties regardless of time period, while “within” statistics are calculated over 21 year-long (or 20 year-long) time periods regardless of county. While many dependent variables and several independent variables in the panel dataset vary over both counties and year, the panel dataset includes some independent variables that do not vary across counties or over time. Time-invariant independent variables have zero within variation, and the LANDAREA, CBD, HIGHWAY, RAILWAY, AIRPORT, SEAPORT, FTZ, ATLMSA, and SMALLMSA dummy variables are time-invariant. Individual-invariant independent variables have zero between variation, so the time dummies RECESSION 1 and RECESSION 2 are county-invariant. For all other variables but UNEMP and HIGHSCHOOL, more variation exists across counties (between variation) than over time (within variation).

Table 4.6. Descriptive Statistics of Intra-state Locational Factor Models

Dependent Variable				Mean	Std. Dev.	Min.	Max.	Obs.
Category	Name	Definition						
Employee	FDI	Natural logarithm of county total manufacturing FDI employees	overall	3.144	3.060	0.000	9.579	N=3339
			between		2.896	0.000	9.081	n= 159
			within		1.015	-2.656	8.384	T = 21
	High-tech FDI	Natural logarithm of county total high-tech manufacturing FDI employees	overall	1.718	2.534	0.000	8.501	N=3339
			between		2.359	0.000	8.163	n= 159
			within		0.943	-3.279	6.972	T = 21
	Non-high-tech FDI	Natural logarithm of county total non-high-tech manufacturing FDI employees	overall	2.691	2.955	0.000	9.289	N=3339
			between		2.775	0.000	8.549	n= 159
			within		1.038	-3.108	7.932	T = 21
	DOMESTIC	Natural logarithm of county total domestic manufacturing employees	overall	7.031	1.720	0.000	11.392	N=3339
			between		1.665	1.871	11.102	n= 159
			within		0.450	2.861	10.034	T = 21
	High-tech DOMESTIC	Natural logarithm of county total high-tech domestic manufacturing employees	overall	3.770	2.497	0.000	10.013	N=3339
			between		2.369	0.000	9.641	n= 159
			within		0.810	-0.427	7.480	T = 21
	Non-high-tech DOMESTIC	Natural logarithm of county total non-high-tech domestic manufacturing employees	overall	6.904	1.721	0.000	11.179	N=3339
			between		1.660	1.223	10.930	n= 159
			within		0.472	2.735	10.556	T = 21
Independent Variable				Mean	Std. Dev.	Min.	Max.	Obs.
Category	Name	Definition						
Agglom-eration Economies	POPDEN (Lagged)	Natural logarithm of population per square mile of land area	overall	4.237	1.149	1.743	7.856	N=3180
			between		1.145	2.064	7.778	n= 159
			within		0.130	3.532	4.878	T = 20
	MFGEMP (Lagged)	Natural logarithm of county total manufacturing sector employees	overall	7.139	1.762	0	11.431	N=3180
			between		1.712	1.517	11.187	n= 159
			within		0.437	2.944	10.490	T = 20
Labor Market	UNEMP (Lagged)	County annual unemployment rate	overall	5.897	2.268	1.400	19.400	N=3180
			between		1.401	2.960	10.130	n= 159
			within		1.787	0.767	17.997	T = 20
	HIGHSCHOOL	Percentage of county total working age adults (25 and over) who graduated from high school or some colleges	overall	0.544	0.071	0.386	0.733	N=3339
			between		0.042	0.409	0.706	n= 159
			within		0.057	0.434	0.728	T = 21
	BACHELOR	Percentage of county total working age adults (25 and over) who have bachelor degree or higher	overall	0.130	0.072	0.042	0.476	N=3339
			between		0.066	0.054	0.390	n= 159
			within		0.028	0.009	0.289	T = 21
Land	LANDAREA	Natural logarithm of county land area(in square miles)	overall	5.807	0.414	4.781	6.794	N=3339
			between		0.415	4.781	6.794	n= 159
			within		0	5.807	5.807	T = 21

Table 4.6. Descriptive Statistics of Intra-state Locational Factor Models (Cont.)

Independent Variable				Mean	Std. Dev.	Min.	Max.	Obs.
Category	Name	Definition						
Accessibi-lity & Transpor-tation	CBD	Natural logarithm of network distance (in miles) between a county centroid and the nearest principal cities	overall	3.347	0.890	-1.939	4.379	N=3339
			between		0.892	-1.939	4.379	n= 159
			within		0	3.347	3.347	T = 21
	HIGHWAY	Natural logarithm of network distance (in miles) between a county centroid and the nearest interstate highway	overall	2.724	1.053	0.100	4.633	N=3339
			between		1.056	0.100	4.633	n= 159
			within		0	2.724	2.724	T = 21
	RAILWAY	Natural logarithm of total length (in miles) of county railway	overall	3.361	1.046	0	5.255	N=3339
			between		1.049	0	5.255	n= 159
			within		0	3.361	3.361	T = 21
	AIRPORT	Natural logarithm of network distance (in miles) between a county centroid and Atlanta international airport	overall	4.676	0.646	2.207	5.646	N=3339
			between		0.648	2.207	5.646	n= 159
			within		0	4.676	4.676	T = 21
	SEAPORT	Natural logarithm of network distance (in miles) between a county centroid and the nearest seaport	overall	5.052	0.671	1.656	5.917	N=3339
			between		0.673	1.656	5.917	n= 159
			within		0	5.052	5.052	T = 21
Taxes & Gov. Promotion	PROTAX (Lagged)	County tax digest millage rates (0~100)	overall	10.689	3.697	0	32.740	N=3180
			between		3.268	3.690	24.995	n= 159
			within		1.746	2.285	19.447	T = 20
	FTZ	County included Foreign Trade Zone=1; other counties=0	overall	0.497	0.500	0	1	N=3339
			between		0.502	0	1	n= 159
			within		0	0.497	0.497	T = 21
Racial Density	BLACKDEN	Percentage of county population that is Black	overall	0.273	0.173	0	0.794	N=3339
			between		0.170	0.002	0.770	n= 159
			within		0.034	0.009	0.499	T = 21
	ASIANDEN	Percentage of county population that is Asian	overall	0.007	0.010	0	0.107	N=3339
			between		0.009	0	0.072	n= 159
			within		0.004	-0.036	0.050	T = 21
MSA	ATLMSA	28-County Atlanta metropolitan area=1; other counties=0	overall	0.176	0.381	0	1	N=3339
			between		0.382	0	1	n= 159
			within		0	0.176	0.176	T = 21
	SMALLMSA	Counties in Metropolitan statistical areas, but not in Atlanta MSA=1; other counties=0	overall	0.264	0.441	0	1	N=3339
			between		0.442	0	1	n= 159
			within		0	0.264	0.264	T = 21
RECE-SSION	RECESSION1	Years after the early 2000s recession (2002<year<=2007) =1; other years=0	overall	0.238	0.426	0	1	N=3339
			between		0	0.238	0.238	n= 159
			within		0.426	0	1	T = 21
	RECESSION2	Years after the 2007 great recession (2007<year<=2010) =1; other years=0	overall	0.143	0.350	0	1	N=3339
			between		0	0.143	0.143	n= 159
			within		0.350	0	1	T = 21

4.1.2. Intra-metropolitan Locational Factor models

Hypothesis

The intra-metropolitan spatial pattern analysis in Chapter 3 suggests that suburbanization of manufacturing FDI within the Atlanta metropolitan area has occurred over the last two decades. This study seeks locational factors influencing the intra-metropolitan suburbanization over time. The study pays particular attention to the loss of industrial land in the central city within a large metropolitan context. Table 4.7 displays changes of industrial land area within the Atlanta metropolitan area over the past decade. Due to unavailability of data, this study calculates industrial land areas for the 13-county Atlanta metropolitan area from 1999 to 2010.[7] Data for seven additional counties is available from 2005 to 2010. Total industrial land area increased by 7,187 acres (14.2%) within the 13-county metropolitan boundary between 1999 and 2010. Considering the expanded 20-county metropolitan boundary, a 3.3 percent increase (2,183 acres) in industrial land occurred from 2005 to 2010. However, the City of Atlanta lost 1,059 acres or 17.2% of its industrial land for the same period. Accordingly, a significant loss of urban industrial land took place in the center of the metropolitan area at the same time that developments of new industrial land extended to rural areas or otherwise undeveloped land at the outskirts of the metropolitan area. Figure 4.2 shows these patterns.

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[7] The Atlanta Regional Commission (ARC)'s LandPro Database provides specific land cover/use types derived from aerial photography for the 13-county Atlanta metropolitan region from 1999 to 2010. Data for seven additional counties is available from 2005 to 2010, with four missing years: 2000, 2001, 2004, and 2006. The study calculates the values for the missing years by linear interpolation.

Table 4.7. Change of Industrial Land Area

Year	13-county Atlanta metropolitan area		20-county Atlanta metropolitan area		City of Atlanta	
	Acres of Industrial Land Area	Percent of Total Land Area	Acres of Industrial Land Area	Percent of Total Land Area	Acres of Industrial Land Area	Percent of Total Land Area
1999	50,751	2.0%	-	-	6,153	7.2%
2000 *	51,809	2.0%	-	-	6,124	7.2%
2001	52,868	2.1%	-	-	6,095	7.2%
2002 *	53,792	2.1%	-	-	6,077	7.1%
2003	54,716	2.2%	-	-	6,059	7.1%
2004 *	55,651	2.2%	-	-	5,663	6.6%
2005	56,586	2.2%	66,865	1.7%	5,266	6.2%
2006 *	57,602	2.3%	68,015	1.7%	5,266	6.2%
2007	58,617	2.3%	69,164	1.7%	5,266	6.2%
2008	57,711	2.3%	68,434	1.7%	5,198	6.1%
2009	58,047	2.3%	69,176	1.7%	5,117	6.0%
2010	57,937	2.3%	69,048	1.7%	5,095	6.0%
1999 to 2010 Change (Change Rate)	+7,187 acres (+14.2%)		+2,183 acres (+3.3%)		−1,059 acres (−17.2%)	

Source: Author's calculations based on the ARC LandPro Database
* Values for 2000, 2001, 2004, and 2006 are calculated by linear interpolation.

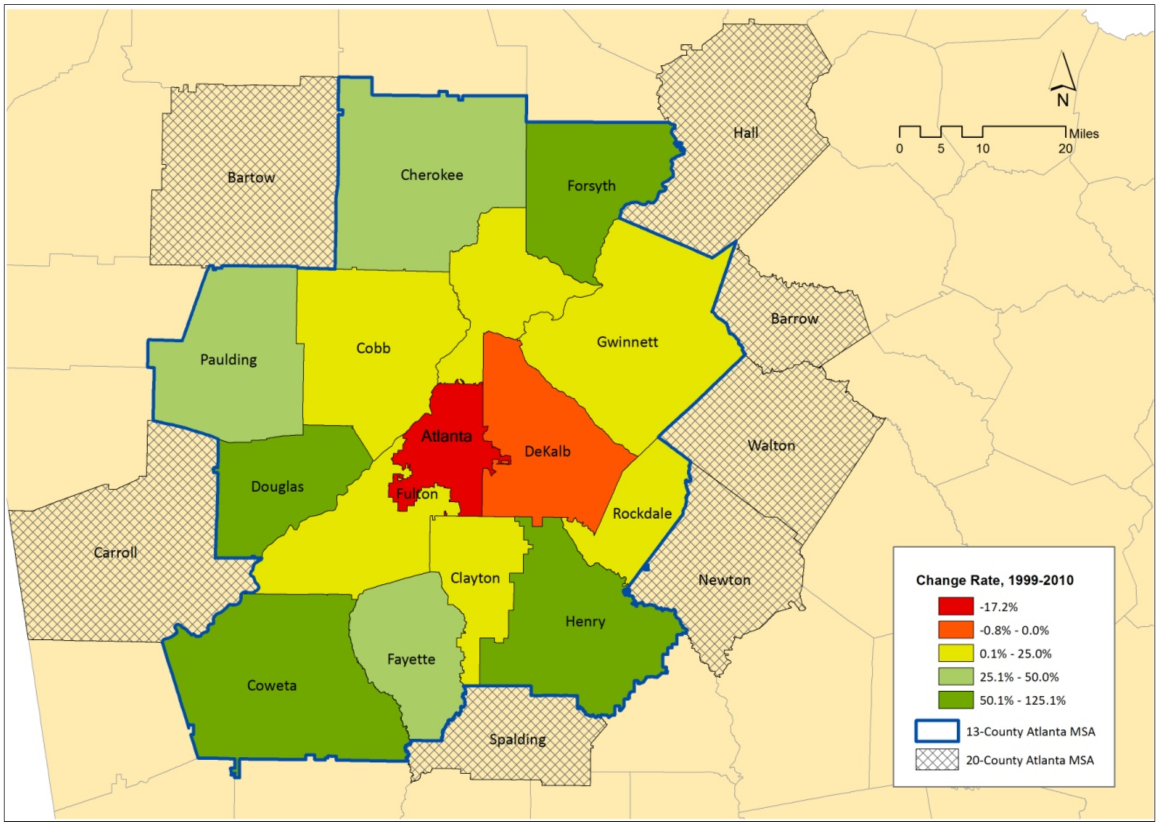

Figure 4.2. Change Rate of Industrial Land Area
Source: Author's calculations based on the ARC LandPro Database

Leigh and Hoelzel (2012) recently argued that anti-sprawl development policies, such as smart growth, are not effective in resisting increased conversion pressures on industrial land, and thus, these policies have made central cities less attractive locations for manufacturing and other industrial activity over the decades. This study empirically tests this argument by exploring how urban industrial land loss has affected the suburbanization of FDI manufacturing jobs. It assumes that the loss of urban industrial land in the central city within a large metropolitan area has been associated with the suburbanization of FDI in manufacturing jobs from 1999 to 2010.

Methods and Variables

Like the intra-state locational factors model, this study establishes a panel data regression model to examine how urban industrial land loss has affected the suburbanization of FDI in manufacturing jobs within a large metropolitan area over time. It applies the lagging approach to address the endogeneity problem. Among various possible models, including ordinary least squares (OLS), fixed-effects model, random-effects models, and feasible generalized least squares (FGSL), it chooses a FGSL that allows relaxation of heteroskedasticity and autocorrelation assumptions.[8]

The geographic unit is the county. It is possible to calculate total industrial land areas, the primary explanatory variable in the intra-metropolitan locational model, for each county in GIS with the Atlanta Regional Commission's LandPro Database. However, this data is available only for the 13 counties in the Atlanta metropolitan area from 1999 to 2010. This relatively small number of observations (13counities * 12 years=156 observations) may cause multicollinearity problems. To deal with this issue, the study considers smaller geographic units, e.g., school attainment zones, instead of the county, but many explanatory variables are not available in the small size study area or for long periods of time. Instead, the study adds industrial land area data for seven additional counties from 2005 to 2010. The increasing number of observations

[8] Like the intra-state locational factors model, the study conducts a series of formal tests to examine the presence of fixed- and/or random-effects in the intra-metropolitan panel data. It includes an F-test for fixed-effects, a Breusch-Pagan LM test for random-effects, and a Hausman test for comparing fixed- and random-effects. The study further conducts the Wald test and Wooldridge tests to test heteroskedasiticity and/or autocorrelation in the panel data.

(13counities * 12 years +7 additional counties * 6 years =198 observations) may relax multicollinearity problems.

The study also adds some explanatory variables not included in the previous intra-state model, including industrial land, vacant land, manufacturing wage, and multiple job center locations. Industrial land is the explanatory variable of primary interest to this study because industrial land availability is more important in the manufacturing sector. A county with a larger industrial land area would appear to have an advantage in attracting foreign manufacturers. As discussed before, this study expects that the significant loss of urban industrial land in the center of the Atlanta metropolitan area made those areas less attractive locations for manufacturing FDI. The study also adds an additional variable to control availability of non-industrial land areas: vacant land areas. The study calculates the total industrial and vacant land areas for each county in GIS with the Atlanta Regional Commission's LandPro Database.

Manufacturing wage is an important factor in the intra-regional labor markets. The literature indicated that higher wage levels are negatively related to the location of manufacturing FDI (Coughlin et al., 1991; J. Friedman et al., 1992; Kim et al., 2003; List, 2001). However, in contrast to the findings in previous empirical literature, Coughlin and Segev (2000) found a positive and statistically significant relationship between wage rates and the location of manufacturing FDI. Further, some studies on Japanese investment in the United States found that Japanese manufacturers were located in areas that are characterized by higher wages to ensure labor force stability and to develop higher levels of human capital (Head et al., 1999; Smith & Florida, 1994). Thus, this study would not necessarily expect to find a negative relationship between wage rates and the location of manufacturing FDI within a metropolitan area. The study adopted the county-level wage rates from County Business Patterns, which measures the rates as the average annual wage for production workers in manufacturing. The study deflates this data by the consumer price index to express the wages in 2010 dollars.

While the study excludes accessibility and transportation variables, including CBD, railway, highway, and seaport, that are previously included in the intra-state model in the intra-metropolitan level analysis, this study considers accesses to polycentric patterns of job centers. Using GIS-based network analysis, the study calculates the real distances between the center of each county and three job center locations in the Atlanta metropolitan area: the Atlanta International Airport, the center of the City of Atlanta, and the center of the City of Alpharetta. These variables can be used as proxies for urbanization economies and land costs (Arauzo-Carod & Viladecans-Marsal, 2009; Coughlin & Segev, 2000). Table 4.8 displays the thirteen explanatory variables used in the intra-metropolitan locational factor model. Table 4.9 shows descriptive statistics of the 20-county Atlanta metropolitan panel dataset.

Table 4.8. Independent Variables for Intra-metropolitan Locational Factor models

Category	Variable	Definition	Data Source	Time	Exp-ected sign	Lag
Labor Market	UNEMP	County annual unemployment rate	Labor Force Employment and Unemployment, Georgia LaborMarket Explorer	1990 – 2009	?	One year
	MFGWAGE	Natural logarithm of county average annual wage in manufacturing (deflated by the consumer price index to be expressed in 2010 dollars)	County Business Patterns (CBP), US Census Bureau	1990 – 2009	?	One year
	HIGHSCHOOL	Percentage of county total working age adults (25 and over) who graduated from high school or higher education	Census Bureau, 1990, 2000 Censuses of Population, and the 2006-2010 American Community Survey	1990 – 2009	+	
Land	INDLAND	County total industrial land area (in square miles)	GIS analysis with ARC LandPro database, 1999, 2001, 2003, 2005, and 2007-2010	1999 (2005) - 2010	+	One year
	VACANTLAND	County total vacant land area (in square miles)	GIS analysis with ARC LandPro database, 1999, 2001, 2003, 2005, and 2007-2010	1999 (2005) - 2010	+	One year
Agglomer-ation & Accessibi-lity	AIRPORT	Natural logarithm of network distance (in miles) between a county centroid and Atlanta international airport	GIS network analysis with National Transportation Atlas Database 2010		-	
	ATLANTA	Natural logarithm of network distance (in miles) between a county centroid and center of the City of Atlanta	GIS network analysis with National Transportation Atlas Database 2010		-	
	ALPHARETTA	Natural logarithm of network distance (in miles) between a county centroid and center of the City of Alpharetta	GIS network analysis with National Transportation Atlas Database 2010		+	
Taxes & Gov. Promotion	PROTAX	County tax digest millage rates (0~100)	Annual Property Values data, Georgia Department of Revenue	1990 – 2009	-	One year
Racial Density	BLACKDEN	Percentage of county population that is Black	Population Estimates: County Intercensal Estimates, US Census Bureau	1990 – 2009	?	
	ASIANDEN	Percentage of county population that is Asian	Population Estimates: County Intercensal Estimates, US Census Bureau	1990 – 2009	?	
Recession	RECESSION1 (Dummy)	Years after the early 2000s recession (2002<year<=2007) =1; other years=0			-	
	RECESSION2 (Dummy)	Years after the 2007 great recession (2007<year<=2010)=1; other years=0			-	

Table 4.9. Descriptive Statistics of Intra-metropolitan Locational Factor models

Dependent Variable				Mean	Std. Dev.	Min.	Max.	Obs.
Category	Name	Definition						
Employee	FDI	Natural logarithm of county total manufacturing FDI employees	overall	7.016	1.195	3.258	9.579	N=240
			between		1.131	4.723	9.194	n = 20
			within		0.457	4.608	8.991	T = 12
	High-tech FDI	Natural logarithm of county total high-tech manufacturing FDI employees	overall	5.207	2.224	0.000	8.443	N=240
			between		1.922	0.000	8.180	n = 20
			within		1.192	0.179	8.796	T = 12
	Non-high-tech FDI	Natural logarithm of county total non-high-tech manufacturing FDI employees	overall	6.536	1.356	2.303	9.289	N=240
			between		1.296	3.151	8.729	n = 20
			within		0.487	4.172	9.004	T = 12
	DOMESTIC	Natural logarithm of county total domestic manufacturing employees	overall	8.981	1.026	7.132	11.392	N=240
			between		1.034	7.219	11.135	n = 20
			within		0.181	8.330	9.681	T = 12
	High-tech DOMESTIC	Natural logarithm of county total high-tech domestic manufacturing employees	overall	7.011	1.494	4.127	10.013	N=240
			between		1.485	4.510	9.696	n = 20
			within		0.361	5.821	8.502	T = 12
	Non-high-tech DOMESTIC	Natural logarithm of county total non-high-tech domestic manufacturing employees	overall	8.768	0.976	7.009	11.179	N=240
			between		0.980	7.077	10.950	n = 20
			within		0.192	8.008	9.522	T = 12
Independent Variable				**Mean**	**Std. Dev.**	**Min.**	**Max.**	**Obs.**
Category	Name	Definition						
Labor Market	UNEMP (Lagged)	County annual unemployment rate	overall	4.935	2.089	1.500	14.000	N=220
			between		0.729	3.727	6.609	n = 20
			within		1.964	2.126	12.326	T = 11
	MFGWAGE (Lagged)	Natural logarithm of county average annual wage in manufacturing (in 2010 dollars)	overall	10.670	0.124	10.388	11.004	N=220
			between		0.113	10.513	10.927	n = 20
			within		0.057	10.474	10.815	T = 11
	HIGHSCHOOL	Percentage of county total working age adults (25 and over) who graduated from high school or higher education	overall	0.812	0.076	0.579	0.936	N=240
			between		0.063	0.700	0.924	n = 20
			within		0.044	0.626	0.876	T = 12
Land	INDLAND	County total industrial land area (in square miles)	overall	7.759	0.942	5.877	9.524	N=178
			between		0.896	6.124	9.504	n = 20
			within		0.119	7.368	8.232	T-bar=8.9
	VACANTLAND	County total vacant land area (in square miles)	overall	11.323	0.666	9.769	12.430	N=178
			between		0.663	10.051	12.417	n = 20
			within		0.117	11.041	11.623	T-bar=8.9

Table 4.9. Descriptive Statistics of Intra-metropolitan Locational Factor models (Cont.)

Independent Variable				Mean	Std. Dev.	Min.	Max.	Obs.
Category	Name	Definition						
Accessibility & Transportation	AIRPORT	Natural logarithm of network distance (in miles) between a county centroid and Atlanta international airport	overall	3.473	0.507	2.207	4.179	N=240
			between		0.519	2.207	4.179	n = 20
			within		0.000	3.473	3.473	T = 12
	ATLANTA	Natural logarithm of network distance (in miles) between a county centroid and center of the City of Atlanta	overall	3.378	0.674	0.850	4.035	N=240
			between		0.690	0.850	4.035	n = 20
			within		0.000	3.378	3.378	T = 12
	ALPHARETTA	Natural logarithm of network distance (in miles) between a county centroid and center of the City of Alpharetta	overall	3.633	0.405	2.707	4.210	N=240
			between		0.414	2.707	4.210	n = 20
			within		0.000	3.633	3.633	T = 12
Taxes & Gov. Promotion	PROTAX (Lagged)	County tax digest millage rates (0~100)	overall	8.099	2.689	2.000	14.880	N=220
			between		2.550	3.490	13.583	n = 20
			within		1.012	4.910	12.440	T = 11
Racial Density	BLACKDEN	Percentage of county population that is Black	overall	0.226	0.159	0.001	0.653	N=240
			between		0.153	0.017	0.597	n = 20
			within		0.055	-0.211	0.364	T = 12
	ASIANDEN	Percentage of county population that is Asian	overall	0.025	0.021	0.004	0.107	N=240
			between		0.021	0.007	0.091	n = 20
			within		0.006	0.000	0.056	T = 12
RECESSION	RECESSION1	Years after the early 2000s recession (2002<year<=2007) =1; other years=0	overall	0.417	0.494	0.000	1.000	N=240
			between		0.000	0.417	0.417	n = 20
			within		0.494	0.000	1.000	T = 12
	RECESSION2	Years after the 2007 great recession (2007<year<=2010) =1; other years=0	overall	0.250	0.434	0.000	1.000	N=240
			between		0.000	0.250	0.250	n = 20
			within		0.434	0.000	1.000	T = 12

4.2. Intra-state Locational Factor of FDI

Table 4.10 gives the estimated results of the panel model for the locational factors of all FDI in 159-county Georgia with z statistics given in parentheses next to the coefficient estimates. Many variables have the expected signs, although several are insignificant. A large contribution of agglomeration economies to spatial concentration of foreign manufacturers appears to exist. Both population density (POPDEN) and manufacturing employment level (MFGEMP) are positively significant determinants. Densely populated counties and counties with strong existing manufacturing activities have a significantly higher expected concentration of jobs in foreign manufacturing plants: a 1 percentage point rise in the county population density and manufacturing employment level induces a 1.7 and 0.01 percent increase in manufacturing FDI employment, respectively. This result supports previous findings–namely that these two categories of agglomeration economies are important factors in determining location selection for FDI (Coughlin & Segev, 2000; Coughlin et al., 1991; Smith & Florida, 1994; Woodward, 1992).

Variables in the labor market category such as unemployment rate and education attainment are negatively insignificant determinants. Although unemployment rate is a negative and statistically insignificant influence on manufacturing FDI employment, this result contrasts with the previous inter-state level studies finding that higher unemployment rates as an indicator of labor availability are positively related to FDI (Coughlin et al., 1991; J. Friedman et al., 1992; Kandogan, 2012). Rather, this result is consistent with the inter-county level study in Woodward (1992), suggesting that foreign manufacturers seek to avoid counties with higher unemployment rates because they view these areas as offering less-competitive industrial conditions and a lower quality of life.

The statistically significant and positive sign of county total land area (LANDAREA) indicates that larger counties attract more FDI than smaller counties, ceteris paribus. This result supports Bartik (1985)'s "dartboard theory" of industrial location with respect to FDI, finding that larger counties attract more FDI than smaller counties.

This study explores whether accessibility and transportation matter in FDI site selection at the local level but achieves mixed results. The negative signs of CBD and HIGHWAY indicate that an increase in distance to CBDs (principal cities in MSA) and interstate highways decreases the attractiveness to manufacturing FDI. The positive and statistically significant sign of RAILWAY (total length of railway in each county) suggests that rail service is another important locational factor. In contrast, the estimates of AIRPORT and SEAPORT do not have the expected signs and statistical significance. Although several studies show that convenient access to airports and seaports increases the attractiveness of investment sites (Coughlin et al., 1991; Wei et al., 2010; Wu, 2000), it is hard to interpret such positive signs in these results. However, interesting results appeared in the next specific panel regression models for high-tech and non-high-tech manufacturing FDI.

While several empirical studies did not find property taxes to be a statistically significant determinant of FDI location (Coughlin & Segev, 2000; List, 2001; Woodward, 1992), the negative and statistically significant sign of PROTAX in Table 4.10 is consistent with the conventional argument that property taxes are an important intra-regional locational factor (Blair & Premus, 1987). In addition, this study finds that the presence of FTZs positively correlates with manufacturing FDI.

While very few studies have included racial preference in their locational factor analysis, this study is unique in its use of racial density to explore whether manufacturing FDI has racial preferences, especially in the intra-regional analysis. Empirical estimate in this study suggests that foreign manufacturers prefer locations with a higher percentage of Black population, but Asian density is negatively correlated and statistically insignificant.

This study includes dummy variables that represent the periods of recession in the early 2000s and the 2007 great recession to measure how these recessions have affected the employment and location of FDI. The results suggest that both the 2002 and the 2007 recessions had a substantial negative impact on the employment and location of manufacturing FDI, although the 2007 great recession had a greater impact than the one in 2002.

Table 4.10. Estimated Results for Intra-state Locational Factor of FDI

Category	Independent Variable	Dependent Variable					
		All FDI		High-tech FDI		Non-high-tech FDI	
		Coef.	z	Coef.	z	Coef.	z
Agglomeration Economies	POPDEN (Lagged)	1.651***	37.18	0.479***	15.39	1.436***	32.84
	MFGEMP (Lagged)	0.013*	1.78	0.006	1.06	0.017**	2.48
Labor Market	UNEMP (Lagged)	-0.002	-1.21	-0.002	-1.60	-0.001	-0.89
	HIGHSCHOOL	-0.188*	-1.73	-0.395***	-5.50	-0.311***	-2.87
	BACHELOR	-0.011	-0.04	0.583***	3.23	0.505**	2.02
Land	LANDAREA	1.120***	14.43	0.191***	3.70	0.907***	12.39
Accessibility & Transportation	CBD	0.001	0.02	-0.841***	-15.44	-0.113**	-2.15
	HIGHWAY	-0.422***	-10.03	-0.129***	-4.80	-0.513***	-12.65
	RAILWAY	0.380***	17.05	0.078***	3.99	0.291***	12.57
	AIRPORT	0.616***	5.27	-0.134*	-1.81	1.150***	11.25
	SEAPORT	0.914***	11.65	-0.243***	-4.84	1.153***	16.77
Taxes & Gov. Promotion	PROTAX (Lagged)	-0.004**	-2.39	-0.001	-0.79	-0.004**	-2.23
	FTZ	1.271***	13.32	-0.174***	-3.15	0.684***	8.39
Racial Density	BLACKDEN	0.879***	5.33	-0.196*	-1.96	0.806***	5.11
	ASIANDEN	-0.474	-0.17	16.480***	6.93	4.441	1.45
MSA	ATLMSA	-0.612***	-3.66	0.087	0.95	0.944***	5.99
	SMALLMSA	-0.850***	-10.53	-0.829***	-14.43	-0.263***	-3.61
RECESSION	RECESSION1	-0.031**	-2.51	-0.012	-1.54	-0.029**	-2.44
	RECESSION2	-0.071***	-4.14	-0.027**	-2.43	-0.066***	-4.02
	CONS	-18.511***	-18.78	2.983***	4.52	-19.854***	-20.55

Number of observations	3180	3180	3180
Number of groups	159	159	159
Time periods	20	20	20
Wald chi2	9155.2***	1339.6***	7113.8***

*** p<0.01, ** p<0.05, * p<0.1

This study carries out specific panel regressions using high-tech and non-high-tech FDI employment as dependent variables and the previously used variables in the all FDI model as independent variables. This study also analyzes panel regressions using FGLS that allows for the relaxation of heteroskedasticity and autocorrelation assumptions. The second and third columns in Table 4.10 report the results of these analyses.

This study finds that education attainment, in particular earning a bachelor degree or higher (BACHELOR), becomes an important locational factor for both high-tech and non-high-tech manufacturing FDI. This result is consistent with the literature that high-tech firms typically have unique labor requirements (i.e., highly educated and trained scientists and engineers), and thus the presence of a skilled workforce can attract more of those industries (DeVol, 1999; Kimelberg & Nicoll, 2012).

The variable of county total land areas (LANDAREA) has a positive influence on foreign firms belonging to both high-tech and non-high-tech groups, but non-high-tech manufacturing FDI is more sensitive to county land areas (LANDAREA) than is high-tech FDI. Various reasons may explain this differentiation–perhaps traditional (non-high-tech) manufacturing firms seek relatively expansive industrial properties and thus are more likely to locate in a larger county (Note that the study uses county total land area as a proxy for the number of potential sites).

This study finds that accessibility and transportation have different effects in intra-regional site selection for FDI. First, the estimated coefficient of CBDs for high-tech manufacturing FDI has significance with a considerably larger negative sign, as compared to non-high-tech firms. Thus, this result indicates that high-tech manufacturing FDI s more sensitive to accessibility to CBDs. Notably, the estimates of AIRPORT and

SEAPORT for the all FDI model do not have the expected signs and statistical significance although several studies showed that convenient access to airport and seaport increased the attractiveness of investment sites (Coughlin et al., 1991; Wei et al., 2010; Wu, 2000). The separation of models for high-tech and non-high-tech manufacturing, however, revealed different accessibility and transportation preferences between the two sub-sectors. For non-high-tech manufacturing FDI, coefficients of these variables are still positive and become statistically significant. For high-tech manufacturing FDI, by contrast, airport and seaport have statistically significant and negative signs. This result emphasizes the importance of air and maritime transportation systems in driving high-tech sector FDI decisions. In particular, the location of international airports corresponds to high technology manufacturing clusters.

Perhaps the most interesting result uncovered in this analysis is the racial preference differentials between high-tech and non-high-tech manufacturing FDI. The Asian density variable (ASIAN) has a statistically positive coefficient, but the Black population density variable (BLACK) is a negative and statistically significant influence for high-tech manufacturing FDI. Meanwhile, the coefficient of the Black density variable for non-high-tech manufacturing FDI is a statistically positive sign, meaning that foreign manufacturers in the non-high-tech sector do not avoid areas with significant Black populations.

4.3. Intra-metropolitan Locational Factor of FDI

To examine intra-metropolitan locational factors of FDI, the study carries out a panel regression using manufacturing FDI employment as a dependent variable. Given intra-metropolitan level analysis, the model specifically examines how the loss of urban industrial land in the central city within a large metropolitan area has been associated with the suburbanization of FDI in manufacturing jobs from 1999 to 2010. Table 4.11 gives the estimated results of the panel model for the intra-metropolitan location determinants of FDI in the 20-county Atlanta MSA.

Significantly, industrial land area (INDLAND) in the first column is a positively significant location determinant of manufacturing FDI. A 1 percent rise in the county total industrial land leads to a 0.99 percent increase in manufacturing FDI employment. This result strongly supports the research assumption that a county with larger industrial land area would appear to have an advantage in attracting foreign manufacturers and related jobs. As discussed in the previous section, the center of the Atlanta metropolitan area lost a significant proportion of its industrial land over the last decade, while new industrial land developments emerged in counties at the outskirts of the metropolitan area. Therefore, the loss of industrial land may make central cities and inner suburbs less attractive locations, contributing to a strong decentralization of manufacturing FDI jobs toward the fringe of the metropolitan area.

Further, while the industrial land area has a positive influence on the location decision of both high-tech and non-high-tech manufacturing FDI, the strength of this influence varies by sector. Non-high-tech has a relatively larger coefficient and is more sensitive to the amount of a county's industrial land, compared to high-tech. While a 1 percentage increase in the county total industrial land area induces a 1.05 percent increase in FDI manufacturing jobs for non-high-tech sector, it induces a 0.64 percent increase in jobs for high-tech sector. In addition, the coefficient of vacant land area (VACANTLAND) for high-tech FDI is a statistically significant and negative sign, while the coefficient for non-high-tech is a statistically insignificant but positive. Because greenfield sites in suburban or rural areas are easy to acquire and develop for industrial purpose with relatively lower costs, traditional non-high-tech manufacturers who seek relatively large industrial properties may prefer a county with large vacant land areas (Mistry & Byron, 2011). In contrast, high-tech manufacturers can accommodate low-inventory/manufacture-to-order production techniques that may reduce the need for property size (Fitzgerald & Leigh, 2002; Leigh, 1996). Therefore, the location decisions of high-tech manufacturers are relatively less sensitive to industrial land area, and the greenfield sites in suburban or rural areas are not necessarily attractive.

Rather, central areas in the metropolitan area are attractive for high-tech manufacturing FDI. The negative and statistically significant sign of ATLANTA for high-tech indicates that access to Atlanta's downtown area becomes an important factor for high-tech FDI locations, *ceteris paribus*. The study uses this variable as a proxy for urbanization economies and/or land costs in this intra-metropolitan level analysis. Foreign manufacturers in high-tech sector tend to locate in more densely populated central areas that usually provide innovative environments, and high land cost in those areas does not deter the location of high-tech manufacturing FDI.

Table 4.11. Estimated Results for Intra-metropolitan Locational Factor of FDI

Category	Independent Variable	Dependent Variable					
		All FDI		High-tech FDI		Non-high-tech FDI	
		Coef.	z	Coef.	z	Coef.	z
Labor Market	UNEMP (Lagged)	-0.020	-1.61	-0.010	-0.41	-0.020*	-1.92
	MFGWAGE (Lagged)	0.557*	1.86	1.013*	1.78	0.398	1.50
	HIGHSCHOOL	-0.416	-0.32	-3.225	-1.50	0.518	0.41
Land	INDLAND (Lagged)	0.994***	7.92	0.653***	3.17	1.052***	8.22
	VACANTLAND(Lagged)	-0.243	-1.38	-0.836***	-2.78	0.075	0.46
Accessibility & Transportation	AIRPORT	0.935**	2.50	0.100	0.17	0.985***	2.71
	ATLANTA	-0.444**	-2.18	-0.968***	-3.25	-0.266	-1.28
	ALPHARETTA	0.987***	3.18	0.639	1.32	0.765***	2.66
Taxes & Gov. Promotion	PROTAX (Lagged)	-0.066***	-2.82	-0.087**	-2.03	-0.070***	-3.37
Racial Density	BLACKDEN	-1.527*	-1.93	-7.109***	-4.84	0.456	0.61
	ASIANDEN	10.454**	2.41	22.590***	3.50	8.327*	1.84
RECESSION	RECESSION1	-0.146**	-2.30	-0.165	-1.46	-0.100*	-1.69
	RECESSION2	-0.223***	-2.75	-0.338**	-2.26	-0.167**	-2.30
CONS		-7.776*	-1.79	4.484	0.56	-11.745***	-2.87
Number of observations		178		178		178	
Number of groups		20		20		20	
Time periods		11		11		11	
Wald chi2		345.2***		202.6***		431.0***	

*** p<0.01, ** p<0.05, * p<0.1

In addition, the estimate results indicate that higher wage levels are positively related to the location of both high-tech and non-high-tech manufacturing FDI. In particular, a positive and statistically significant relationship exists between wage rates and the locations of high-tech manufacturing FDI. The magnitude of effect is substantial. A 10-percent increase in the county average annual wage for production workers in manufacturing is associated with a 10.1 percent increase in employment levels of manufacturing FDI in the high-tech sector. This finding demonstrates that high-tech foreign manufacturing firms, which typically require more highly educated and trained workers, are willing to pay more for their labor needs and prefer to locate their establishments within, or as close as possible to, a county with higher wage rates in order to ensure labor force stability and to develop higher levels of human capital.

The estimated results suggest that racial preferences play a role in locational decisions by high-tech FDI manufacturers. High-tech manufacturing FDI prefers locations with a higher concentration of Asian population, but tends to avoid counties with high Black population density. While Smith and Florida (1994)'s study suggested that Japanese automotive-related manufacturers tend to locate in counties with a higher non-white population, no empirical studies exist on the specific racial preferences of high-tech manufacturing FDI within intra-metropolitan area.

These results are consistent with the findings in the intra-metropolitan spatial patterns of manufacturing FDI in Chapter Three. Job growth in the high-tech manufacturing FDI sector occurred primarily in the northern part of the metropolitan area, rather than the southern part. This study has identified the suburbs of Gwinnett, Cobb and Fulton Counties as an emerging job cluster of high-tech manufacturing FDI, and this job cluster has remained strong over the past two decades. These northern suburban counties have higher Asian populations. In particular, Gwinnett County has the largest Asian population in the state. In 2010, according to US Census data, about 10.6 percent of the county's population was Asian while Georgia's population was only 3.3 percent Asian. Other reasons may explain why foreign manufacturers tend to locate in the northern suburban counties with higher Asian density. For example, the presence of a strong Asian community may make such areas magnets for foreign companies from South Korea, Japan, and China. Meanwhile, non-high-tech manufacturing FDI tends to locate in counties with a higher black density while a significant effect of Asian density exists with regard to the location of non-high-tech manufacturing FDI.[9]

These results suggest different implications for high-tech and traditional (non-high-tech) manufacturing FDIs. For traditional manufacturing FDI, the significant conversion of industrial land use to other uses in the center of the metropolitan area may make these locations less attractive and thus may contribute to job sprawl. On the other hand, the central area is still a desirable location for high-tech manufacturing FDI. The higher land costs in central areas does not deter the location of high-tech manufacturing FDI, which can accommodate smaller and compartmentalized factories within multi-story sites in the urban core. Such enterprises tend to locate within, or as close as possible to, more densely populated central areas with well-trained, knowledgeable workers, even if this results in paying higher wages.

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[9] These findings may suggest racial preferences of manufacturing FDI either as pure discrimination or as using race as a proxy for unobserved educational quality in each county. The educational quality data is not available for all of the given study area and time periods. Instead, the study includes some educational quality data–such as high-school graduation rates, proficiency test score, pupil/teacher ratio, and school expenditure–for only limited periods of time. The results show that the magnitude of Asian density is still substantial and statistically significant, although the educational quality variables are included (the educational quality variables are statistically insignificant).

4.4. Locational Factors Differentiation between FDI and Domestic Manufacturing

4.4.1. Intra-state Locational Factors Differentiation

Table 4.12 presents empirical estimates from the panel regression model for each of the six samples–all FDI, all domestic, high-tech FDI, high-tech domestic, non-high-tech FDI, and non-high-tech domestic manufacturing. Unlike the intra-state locational factor model of FDI in Table 4.10, this model excludes manufacturing employment variable to remove multicollinearity.

Population density (POPDEN) is a positively significant determinant of both foreign and domestic manufacturing. BACHELOR is an important locator factor for all domestic manufacturing, but it is not a statistically significant factor for high-tech and non-high-tech domestic manufacturing. Rather, the statistically significant and positive signs of BACHELOR in both high-tech and non-high-tech manufacturing FDI model imply that foreign manufacturers in both sectors prefer counties with more highly educated workers. The statistically significant and positive sign of county total land area (LANDAREA) indicates that larger counties attract both more FDI and domestic manufacturing than smaller counties, ceteris paribus. High-tech manufacturing FDI, however, is less sensitive to total land area, compared to other types of manufacturing.

Several studies have found that high-tech firms tend to cluster along major airport corridors because their supply-chain management and business contacts extensively relies on air shipments and travels (Button, Lall, Stough, & Trice, 1999; Erie, Kasarda, McKenzie, & Molloy, 1999; Kasarda, 1999, 2008). However, this study suggests that the only coefficient of airport for high-tech manufacturing FDI has a statistically significant and negative sign. This implies that foreign firms, especially in the high-tech sector, consider air accessibility especially crucial.

Property tax rate (PROTAX) is an important locational factor for both foreign and domestic manufacturing firms, but it is not statistically significant for high-tech sectors. Foreign Trade Zone (FTZ) is critical for the location decision of manufacturing FDI. However, high-tech manufacturing FDI shows no preference for those areas.

While the study finds that foreign manufacturers prefer locations with a higher percentage of Black population, domestic manufacturers tend to avoid counties with high Black population density. These racial preferences differed for the high-tech and non-high-tech specifications. The coefficient of the Black density variable for non-high-tech manufacturing FDI is a statistically positive sign, but the Black population density variable (BLACK) is a negative influence for other sectors (high-tech manufacturing FDI, high-tech, and non-high-tech domestic manufacturing). Meanwhile, the Asian density variable (ASIAN) is positively correlated to both high-tech and non-high-tech manufacturing FDI.

Table 4.12. Intra-state Locational Factors Differentiation

Category	Independent Variable	Dependent Variable					
		All		High-tech		Non-high-tech	
		FDI	Domestic	FDI	Domestic	FDI	Domestic
Agglomeration Economies	POPDEN (Lagged)	1.655***	1.285***	0.485***	1.711***	1.404***	1.246***
		(37.91)	(40.53)	(15.92)	(32.98)	(32.05)	(38.52)
Labor Market	UNEMP (Lagged)	-0.002	-0.013***	-0.002*	-0.009***	-0.001	-0.012***
		(-1.16)	(-5.95)	(-1.74)	(-2.75)	(-.83)	(-5.13)
	HIGHSCHOOL	-0.200*	-0.912***	-0.385***	-0.202	-0.293***	-1.008***
		(-1.89)	(-6.87)	(-5.46)	(-1.01)	(-2.93)	(-7.15)
	BACHELOR	-0.040	0.224	0.567***	0.393	0.404*	-0.186
		(-0.16)	(1.03)	(3.11)	(0.97)	(1.66)	(-0.81)
Land	LANDAREA	1.138***	1.148***	0.182***	1.448***	0.873***	1.115***
		(14.56)	(20.29)	(3.49)	(18.40)	(11.59)	(19.52)
Accessibility & Transportation	CBD	-0.002	-0.076***	-0.819***	-0.213***	-0.151***	-0.076***
		(-0.03)	(-3.28)	(-15.16)	(-4.39)	(-2.74)	(-3.05)
	HIGHWAY	-0.426***	-0.032*	-0.124***	-0.157***	-0.528***	-0.056***
		(-10.06)	(-1.88)	(-4.61)	(-4.13)	(-12.59)	(-3.25)
	RAILWAY	0.382***	0.180***	0.083***	0.146***	0.297***	0.187***
		(16.93)	(7.09)	(4.27)	(3.16)	(12.30)	(7.36)
	AIRPORT	0.593***	0.208***	-0.136*	0.401***	1.097***	0.219***
		(5.09)	(4.02)	(-1.84)	(4.03)	(10.49)	(4.16)
	SEAPORT	0.916***	0.209***	-0.238***	0.190***	1.144***	0.241***
		(11.6)	(5.60)	(-4.84)	(2.73)	(16.11)	(6.64)
Taxes & Gov. Promotion	PROTAX (Lagged)	-0.004**	-0.006***	-0.001	-0.004	-0.003**	-0.007***
		(-2.37)	(-2.70)	(-0.85)	(-1.04)	(-2.05)	(-2.81)
	FTZ	1.273***	-0.012	-0.162***	0.512***	0.684***	-0.015
		(13.30)	(-0.24)	(-2.88)	(5.57)	(8.12)	(-0.30)
Racial Density	BLACKDEN	0.878***	-0.509***	-0.194*	-0.201	0.759***	-0.659***
		(5.32)	(-4.85)	(-1.88)	(-1.22)	(4.77)	(-6.01)
	ASIANDEN	-0.331	-17.219***	16.469***	-12.053***	4.301	-15.831***
		(-0.12)	(-8.54)	(6.94)	(-3.64)	(1.45)	(-7.76)
MSA	ATLMSA	-0.634***	-0.487***	0.071	-0.391***	0.935***	-0.526***
		(-3.78)	(-6.49)	(0.78)	(-2.93)	(5.74)	(-6.95)
	SMALLMSA	-0.845***	-0.957***	-0.825***	-1.063***	-0.274***	-0.935***
		(-10.79)	(-16.80)	(-14.32)	(-11.05)	(-3.82)	(-16.06)
RECESSION	RECESSION1	-0.031**	-0.094***	-0.012	-0.036*	-0.026**	-0.099***
		(-2.57)	(-7.20)	(-1.53)	(-1.71)	(-2.35)	(-7.11)
	RECESSION2	-0.072***	-0.170***	-0.027**	-0.080***	-0.062***	-0.181***
		(-4.21)	(-9.51)	(-2.45)	(-2.76)	(-3.94)	(-9.48)
	CONS	-18.416***	-6.003***	2.921***	-13.642***	-18.978***	-5.793***
		(-18.47)	(-11.00)	(4.49)	(-15.70)	(-19.01)	(-10.53)
	Number of observations	3180	3180	3180	3180	3180	3180
	Number of groups	159	159	159	159	159	159
	Time periods	20	20	20	20	20	20
	Wald chi2	8979.3***	5746.6***	1326.9***	7996.0***	6270.9***	5197.3***

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.4.2. Intra-metropolitan Locational Factors Differentiation

To examine the differentiation in intra-metropolitan locational factors between foreign and domestic manufacturing, this study carries out panel regressions using all FDI, all domestic, high-tech FDI, high-tech domestic, non-high-tech FDI, and non-high-tech domestic manufacturing employment level as dependent variable, respectively (See Table 4.13). The statistically significant and positive sign of INDLAND indicates that a county with a larger industrial land area would appear to have an advantage in attracting both foreign and domestic manufacturers and their jobs. Compared to other sectors, the coefficient of industrial land area is smaller for high-tech manufacturing FDI and its coefficient of vacant land area is larger, with a negative sign. This result indicates that high-tech manufacturing FDI is least sensitive to industrial land area, and the greenfield sites in the outskirts of the metropolitan area are less attractive for this sector. However, accessibility to Atlanta downtown (ATLANTA) is an important factor for high-tech FDI locations, *ceteris paribus*, implying that the central area is a desirable location for high-tech manufacturing FDI.

Both foreign and domestic manufacturers (in particular high-tech sector firms) tend to avoid counties with high Black population density. Although the study finds that foreign manufacturers (especially, high-tech manufacturing FDI) tend to prefer locations with a higher percentage of Asian population, domestic manufacturers tend to avoid those counties.

Table 4.13. Intra-metropolitan Locational Factors Differentiation

Category	Independent Variable	Dependent Variable					
		All		High-tech		Non-high-tech	
		FDI	Domestic	FDI	Domestic	FDI	Domestic
Labor Market	UNEMP (Lagged)	-0.020 (-1.61)	-0.015** (-1.97)	-0.010 (-0.41)	-0.018* (-1.72)	-0.020* (-1.92)	-0.018** (-2.43)
	MFGWAGE (Lagged)	0.557* (1.86)	-0.011 (-0.06)	1.013* (1.78)	-0.026 (-0.10)	0.398 (1.50)	0.035 (0.21)
	HIGHSCHOOL	-0.416 (-0.32)	0.041 (0.06)	-3.225 (-1.50)	4.915*** (4.85)	0.518 (0.41)	-1.370** (-2.01)
Land	INDLAND (Lagged)	0.994*** (7.92)	1.144*** (13.79)	0.653*** (3.17)	1.256*** (13.23)	1.052*** (8.22)	0.978*** (11.19)
	VACANTLAND (Lagged)	-0.243 (-1.38)	-0.135 (-1.33)	-0.836*** (-2.78)	-0.337** (-2.20)	0.075 (0.46)	-0.019 (-0.17)
Accessibility & Transportation	AIRPORT	0.935** (2.50)	0.226 (1.20)	0.100 (0.17)	-0.480* (-1.75)	0.985*** (2.71)	0.437** (2.28)
	ATLANTA	-0.444** (-2.18)	-0.230** (-2.46)	-0.968*** (-3.25)	0.078 (0.57)	-0.266 (-1.28)	-0.355*** (-3.48)
	ALPHARETTA	0.987*** (3.18)	-0.374** (-2.35)	0.639 (1.32)	-1.226*** (-4.78)	0.765*** (2.66)	-0.261 (-1.61)
Taxes & Gov. Promotion	PROTAX (Lagged)	-0.066*** (-2.82)	-0.001 (-0.05)	-0.087** (-2.03)	0.060*** (3.91)	-0.070*** (-3.37)	-0.014 (-1.40)
Racial Density	BLACKDEN	-1.527* (-1.93)	-1.221*** (-3.14)	-7.109*** (-4.84)	-2.936*** (-5.26)	0.456 (0.61)	-0.277 (-0.69)
	ASIANDEN	10.454** (2.41)	-9.531*** (-4.47)	22.590*** (3.50)	-13.793*** (-4.33)	8.327* (1.84)	-4.876** (-2.06)
RECESSION	RECESSION1	-0.146** (-2.30)	-0.048 (-1.41)	-0.165 (-1.46)	-0.115** (-2.11)	-0.100* (-1.69)	-0.021 (-0.62)
	RECESSION2	-0.223*** (-2.75)	-0.060 (-1.28)	-0.338** (-2.26)	-0.107 (-1.48)	-0.167** (-2.30)	-0.045 (-1.01)
CONS		-7.776* (-1.79)	3.819* (1.74)	4.484 (0.56)	4.036 (1.28)	-11.745*** (-2.87)	3.283 (1.47)
Number of observations		178	178	178	178	178	178
Number of groups		20	20	20	20	20	20
Time periods		11	11	11	11	11	11
Wald chi2		345.2***	1598.7***	202.6***	1590.4***	431.0***	1140.0***

z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

CHAPTER 5

IMPACT OF FDI ON MIDDLE CLASS EARNINGS

5.1. Hypotheses, Methods, and Variables

5.1.1. Place-of-work Earnings Model

The third objective in this study is whether and how the location of manufacturing FDI has reduced (or increased) inequality among people. The research examines the impact of manufacturing FDI on individual earnings. More specifically, it tries to answer the research question of who benefits more from manufacturing FDI job growth. In other words, this study examines differences in whether and how foreign and domestic manufacturing industries affect individual earnings for the middle class, as compared to the lower and upper classes.[10]

Several empirical findings suggest that foreign manufacturing plants pay higher wages than domestic plants (Figlio & Blonigen, 2000; Jackson, 2010; PWC, 2012). Recent data showed that foreign manufacturing firms pay their workers 30 percent more than workers in other U.S. firms receive (U.S. Economics and Statistics Administration, 2011). In addition, Figlio and Blonigen (2000) found that manufacturing FDI raises local real wage in South Carolina. According to their findings, adding a single foreign manufacturing plant to a county is associated with more than a 2.3 percent increase in real wages for all workers in foreign and domestic plants, while the wage increase

[10] This study focuses on individual earnings because the primary concern is whether and how the location of manufacturing FDI affects individual earnings. If the main concern is the potential impact on the standard of living, then household or family income may be the most appropriate measure (See Leigh, 1994, pp.11-13).

associated with an equal-sized new domestic plant is just 0.3 percent (Figlio & Blonigen, 2000).

If manufacturing FDI is the more technologically advanced sector, its manufacturing plants may require higher productivity and thus provide higher wages. Figure 4.1 in Chapter Four shows that a significant portion of manufacturing FDI jobs have occurred in the high-technology sector, and foreign manufacturers in Georgia have steadily provided more than 20,000 jobs in that sector over the past two decades. Because a number of studies have concluded that high-tech jobs are high-paid jobs, compared with other jobs (Heckler, 2005; James & Leary, 2011; National Science Board, 2002), a higher concentration of manufacturing FDI in a particular area may be associated with rising individual earnings for those who work in the area.

However, the question of who benefits more from the location of manufacturing FDI remains open. Previous literature has identified manufacturing as a primary source for middle class jobs characterized by decent wages and benefits, especially for workers without a college degree (Doron, August 2010; Leigh, 1994). Meanwhile, recent analysis has suggested that today's manufacturing requires higher educational attainment since its production systems are capital-intensive and technologically sophisticated (U.S. Executive Office of the President, 2009). Currently, over half of current manufacturing workers have some education beyond high school, and thus manufacturing wages are higher. This study assumes that the location of manufacturing FDI–relative to U.S. domestic manufacturing location–in a particular community has positively influenced individual earnings for the middle class manufacturing worker in that community during the period from 2005- 2010, compared to other classes.

To measure the correlation between the manufacturing FDI concentration and individual earnings for manufacturing workers, the logarithm of individual i's earnings (deflated by the consumer price index to be expressed in 2010 dollars) in specific manufacturing sector (3-digit NAICS) are

$$ln\, E_i = \beta_1 \text{manufacturing FDI employee} + \beta_2 \text{domestic manufacturing employee} + \beta_3 X_i + \beta_4 spatial\text{– dummies} + \beta_5 \text{time– dummies} + \varepsilon.$$

The study calculates total foreign and domestic manufacturing FDI employment levels in each place of work of PUMA (POWPUMA) in each year for each specific manufacturing sector (3-digit NAICS). To control spatial fixed-effects and year period effects, spatial-dummies and time-dummies are included. X_i is a vector of individual i's characteristics. The study applies the following individual characteristics as control variable (X_i):

1) Age
2) Education attainment dummy
3) Race/ethnicity dummy
4) Gender dummy
5) English-language proficiency dummy
6) Occupation (major occupation) dummy

This study uses quantile regression. While OLS regression relies on mean regression analysis, which estimates the average earnings equation conditional on the covariates, quantile regression estimates the earnings equation in various conditional quantiles of earnings. This method is an attractive alternative estimation because it does not impose arbitrary exogenous sample selection criteria to divide the sample, allowing a researcher to estimate as many quantile regressions as possible. No sample selection bias occurs because the method uses the entire sample to estimate each quantile. Furthermore, the quantile regression is robust as to outliers and is especially suitable for heteroscedastic data since it is estimated by minimizing the sum of absolute values of residuals instead of the sum of squared residuals (Cameron & Trivedi, 2009; Koenker & Hallock, 2001). Using quantile regression analysis, this study can develop more detailed and accurate information from the earnings equation at all different levels of earnings (Buchinsky, 1994). This means that the results of quantile regression analysis can answer the research question of who is benefiting more from manufacturing FDI job growth.

The data for individual earnings comes from the American Community Survey (ACS) Public Use Microdata Sample (PUMS) files. ACS is an ongoing survey that serves as a replacement for the former Census long form and covers about 1% of the U.S. population each year (U.S. Census Bureau, 2009b). It releases an annual PUMS, which is a set of untabulated records about individual people or housing units. The earnings data is available at the individual level from the annual PUMS during the period from 2005 to 2011,[11] which lists each worker's total pre-tax wage and salary income as an employee.[12] This provides a unique opportunity to compare different impacts of manufacturing FDI

[11] The ACS is administered throughout the year, and the individual earnings questions refer to the 12 months prior to the date of survey. The respondents have one of 12 different reference periods, and thus their earnings vary with the date they responded to the survey. This study simply assumes the individual earnings are the dollars earned during the previous year of the survey. Therefore, the period of ACS PUMS 2005-2010 corresponds to the 2004-2010 period used in this study.

[12] Sources of personal earning include wages, salaries, commissions, cash bonuses, tips, and other money income received from an employer, but payments-in-kind or reimbursements for business expenses are not included.

location on different earning classes, while other aggregated earning datasets at the county or city level do not. This study also derives other variables representing individual characteristics such as age, education attainment, race/ethics, gender, industry, and occupation from ACS PUMS file.

To protect individual privacy, region, division, state, and PUMAs are the only geographic areas identified in the ACS PUMS, while traditional MSA and county geographic identifiers are not available (U.S. Census Bureau, 2009a). PUMAs are the lowest level of geographic area available. Unlike the previous methods for spatial pattern and locational factor of manufacturing FDI in this study, therefore, the study uses PUMA as a geographic unit of analysis for measuring the impacts of manufacturing FDI on middle class earnings across different local communities. In addition, using POWPUMAs instead of RESPUMAs, this study attempts to match the location of manufacturing FDI and the work place for individual cases in the ACS PUMS.

Individual earnings and characteristics data are extracted from the Integrated Public Use Microdata Series(IPUMS)-USA (Ruggles et al., 2010). There are 286,580 individual observations of Georgia workers in the 2005-2011 ACS PUMS. Among those, the study selects individuals who were 16 years or older, worked in the manufacturing sector, and lived in Georgia. In addition, the study restricts the sample to individuals who reported working at least 50 weeks during the previous year (year-round worker) and usually 35 or more hours per week (full-time worker). This restriction relies on the notion that year-round and/or full-time workers are less likely to have changed jobs than are seasonal and/or part-time workers. The sample also excludes self-employed workers. These restrictions reduce the sample size to 25,363 individual observations.

Table 5.1 summarizes the statistics for the place-of-work earning model. The annual average earnings (in 2010 dollars) in the manufacturing sector in Georgia was $55,086, and the annual earnings ranged from $446 to 422,772, representing the broad range of earnings groups. The study identified an average of 255 manufacturing FDI employees in the specific manufacturing sectors (3-digit NAICS), while the average employee level for domestic manufacturing is 2,884. The average age of manufacturing workers is about 44.

Although a recent report shows that over half of current workers in the manufacturing sector have some education beyond high school (U.S. Executive Office of the President, 2009), the descriptive statistics in Table 5.1 reflect that the percentage of manufacturing workers with a college degree or higher is only 42.5 in the selected sample. White workers represent the largest racial and ethnic group with 65.6 percent, followed by Black, Hispanic, and Asians, comprising 22.3, 8.1, and 3.2 percent of the sample, respectively. The number of male workers is more than double the number of female workers (69.1 percent vs. 30.9 percent). The percentage of manufacturing workers who speak English well is 95.5.

Table 5.1. Descriptive Statistics for Place-of-work Earnings Model

Dependent Variable	Min.	Max.	Mean	St. dev.
EARNINGS (Individual annual earnings in 2010 dollars)	446	422772	55088	49172
ln(EARNINGS) (Natural logarithm of individual annual earnings in 2010 dollars)	6.102	12.955	10.672	0.672

Independent Variable		Min.	Max.	Mean	St. dev.
Category	Name				
Employment	FDIEMP (POWPUMA-specific & industry-specific(3-digit) total manufacturing FDI employees in 1000's)	0.000	4.101	0.255	0.482
	DOMEEMP (POWPUMA-specific & industry-specific(3-digit) total domestic manufacturing employees in 1000's)	0.000	23.799	2.884	5.061
Age	AGE	16.000	92.000	43.970	11.381
	AGE2 (Age squared)	256.000	8464.000	2062.843	1002.965
Education Attainment	LESS HIGHSCHOOL	0.000	1.000	0.122	0.328
	HIGHSCHOOL	0.000	1.000	0.453	0.498
	COLLEGE	0.000	1.000	0.190	0.392
	BACHELOR	0.000	1.000	0.171	0.376
	GRADUATE	0.000	1.000	0.064	0.245
Race/ Ethnicity	WHITE	0.000	1.000	0.656	0.475
	BLACK	0.000	1.000	0.223	0.416
	ASIAN	0.000	1.000	0.032	0.175
	HISPANIC	0.000	1.000	0.081	0.273
Gender	MALE	0.000	1.000	0.691	0.462
	FEMALE	0.000	1.000	0.309	0.462
Language Proficiency	NONENGLISH (Does not speak English)	0.000	1.000	0.045	0.207
	ENGLISH (Speaks well)	0.000	1.000	0.955	0.207
Occupation	OCC1 (Management)	0.000	1.000	0.129	0.335
	OCC2 (Business and Financial Operations)	0.000	1.000	0.042	0.199
	OCC3 (Computer and Mathematical)	0.000	1.000	0.026	0.160
	OCC4 (Architecture and Engineering)	0.000	1.000	0.049	0.216
	OCC5(Life, Physical, and Social Science)	0.000	1.000	0.013	0.112
	OCC6 (Community and Social Service)	0.000	0.000	0.000	0.000
	OCC7 (Legal)	0.000	1.000	0.001	0.039
	OCC8 (Education, Training, and Library)	0.000	1.000	0.003	0.051
	OCC9 (Arts, Design, Entertainment, Sports, and Media)	0.000	1.000	0.009	0.092
	OCC10 (Healthcare Practitioners and Technical)	0.000	1.000	0.002	0.047
	OCC11 (Healthcare Support)	0.000	1.000	0.000	0.006
	OCC12 (Protective Service)	0.000	1.000	0.003	0.057
	OCC13 (Food Preparation and Serving Related)	0.000	1.000	0.001	0.026
	OCC14 (Building & Grounds Cleaning & Maintenance)	0.000	1.000	0.013	0.112
	OCC15 (Personal Care and Service)	0.000	1.000	0.000	0.011
	OCC16 (Sales and Related)	0.000	1.000	0.049	0.216
	OCC17 (Office and Administrative Support)	0.000	1.000	0.109	0.311
	OCC18 (Farming, Fishing, and Forestry)	0.000	1.000	0.001	0.038
	OCC19 (Construction and Extraction)	0.000	1.000	0.018	0.133
	OCC20 (Installation, Maintenance, and Repair)	0.000	1.000	0.057	0.232
	OCC21 (Production)	0.000	1.000	0.381	0.486
	OCC22 (Transportation and Material Moving)	0.000	1.000	0.094	0.292

Table 5.1. Descriptive Statistics for Place-of-work Earnings Model (Cont.)

Independent Variable		Min.	Max.	Mean	St. dev.
Category	Name				
Spatial-dummy (Place-of-work PUMA)	PWPUMA00100	0.000	1.000	0.013	0.114
	PWPUMA00200	0.000	1.000	0.076	0.266
	PWPUMA00300	0.000	1.000	0.018	0.133
	PWPUMA00400	0.000	1.000	0.022	0.147
	PWPUMA00500	0.000	1.000	0.019	0.135
	PWPUMA00600	0.000	1.000	0.031	0.173
	PWPUMA00700	0.000	1.000	0.019	0.136
	PWPUMA00800	0.000	1.000	0.025	0.156
	PWPUMA00900	0.000	1.000	0.009	0.093
	PWPUMA01000	0.000	1.000	0.008	0.091
	PWPUMA01100	0.000	1.000	0.107	0.309
	PWPUMA01200	0.000	1.000	0.042	0.200
	PWPUMA01300	0.000	1.000	0.068	0.252
	PWPUMA01400	0.000	1.000	0.011	0.103
	PWPUMA01500	0.000	1.000	0.076	0.265
	PWPUMA01600	0.000	1.000	0.025	0.157
	PWPUMA01700	0.000	1.000	0.010	0.097
	PWPUMA01800	0.000	1.000	0.022	0.146
	PWPUMA01900	0.000	1.000	0.011	0.103
	PWPUMA02000	0.000	1.000	0.032	0.176
	PWPUMA02100	0.000	1.000	0.028	0.166
	PWPUMA02200	0.000	1.000	0.012	0.108
	PWPUMA02300	0.000	1.000	0.017	0.131
	PWPUMA02400	0.000	1.000	0.011	0.103
	PWPUMA02500	0.000	1.000	0.016	0.125
	PWPUMA02600	0.000	1.000	0.022	0.145
	PWPUMA02700	0.000	1.000	0.015	0.122
	PWPUMA02800	0.000	1.000	0.016	0.127
	PWPUMA02900	0.000	1.000	0.019	0.136
	PWPUMA03000	0.000	1.000	0.016	0.126
	PWPUMA03100	0.000	1.000	0.014	0.116
	PWPUMA03200	0.000	1.000	0.011	0.102
	PWPUMA03300	0.000	1.000	0.017	0.129
	PWPUMA03400	0.000	1.000	0.019	0.137
	PWPUMA03500	0.000	1.000	0.014	0.119
	PWPUMA03600	0.000	1.000	0.009	0.095
	PWPUMA03700	0.000	1.000	0.010	0.097
	PWPUMA03800	0.000	1.000	0.018	0.133
	PWPUMA03900	0.000	1.000	0.017	0.128
	PWPUMA04000	0.000	1.000	0.015	0.123
	PWPUMA04100	0.000	1.000	0.016	0.124
	PWPUMA04200	0.000	1.000	0.015	0.122
	PWPUMA04300	0.000	1.000	0.012	0.107
Time-dummy	YEAR2004	0.000	1.000	0.145	0.353
	YEAR2005	0.000	1.000	0.149	0.356
	YEAR2006	0.000	1.000	0.144	0.351
	YEAR2007	0.000	1.000	0.160	0.366
	YEAR2008	0.000	1.000	0.138	0.345
	YEAR2009	0.000	1.000	0.133	0.340
	YEAR2010	0.000	1.000	0.131	0.337

* N=25,363

5.1.2. Place-of-residence Earnings Model

Because of its multiplier effects, locating a new foreign manufacturing firm may add a number of new jobs both directly from the firm and indirectly from local suppliers, as well as support and service-providers. Accordingly, the new firm not only pays its own employees, but the firm's expenses go toward the purchase of goods and services, including, but not limited to, utilities, wholesale and retail trade, business, professional, management, employment services, and manufactured materials. These expenses also may have positively affected earnings of those who live in the surrounding communities. This study examines whether and how the concentration of manufacturing FDI in a certain community has an indirect impact on the earnings of those who live in the area. Like the place-of work earnings analysis, it also focuses on the earnings distribution effects on the different earnings groups. This study assumes that location of manufacturing FDI–relative to U.S. domestic manufacturing location–in a certain community has positively influenced individual earnings for the middle class workers who lived in that community from 2005-2010, compared to other classes.

The following equation measures the correlation between the manufacturing FDI concentration and individual earnings of those who live in a certain community:

$$\begin{aligned} ln\, E_i = \beta_1 &\text{manufacturing FDI employee} \\ &+ \beta_2 \text{domestic manufacturing employee} \\ &+ \beta_3 X_i + \beta_4 \text{spatial} - \text{dummies} \\ &+ \beta_5 \text{time} - \text{dummies} + \varepsilon \ . \end{aligned}$$

The study deflates the individual i's earnings by the consumer price index to express the earnings in 2010 dollars and transforms them in natural logarithm. It further calculates total foreign and domestic manufacturing FDI employment levels in each RESPUMA in each year. To control spatial fixed-effects and year period effects, spatial-dummies and time-dummies are included. X_i is a vector of individual i's characteristics. In addition to the individual i's age, education attainment, race/ethnicity, gender, English-language proficiency, and occupation previously included in the place-of-work earnings model, this model adds major industry dummies to control industry-fixed effect.

The research extracted individual earnings and characteristics data from the IPUMS-USA (Ruggles et al., 2010). Among 652,533 individual observations involving Georgia residents in the 2005-2011 ACS PUMS, the study selects those individuals who were 16 years or older and worked in Georgia. The study further restricts the sample to individuals who had earnings in the prior year, but does not exclude part-time and non-year-round workers, resulting in 315,753individual observations in this sample.

Table 5.2 presents descriptive statistics for the place-of-residence earnings model. The annual average earning level for Georgia residents (in 2010 dollars) is $42,160, with an average of 2,870 manufacturing FDI employees in RESPUMA. The average employee earning level in domestic manufacturing is $20,665.

Notably, more than 64.5 percent of workers in this sample graduated from some college and/or pursued higher education. Thus, the workers in this sample are more highly educated when compared to the percentage of similarly educated manufacturing workers (42.5 %) in Table 5.1. While male workers predominate in the manufacturing sector (69.1 percent) as shown in Table 5.1, no great difference exists between the numbers of male and female workers in this sample.

Other statistics are similar to those found in the place-of-work earnings model. The average age is about 41. White workers comprised the largest racial and ethnic group with 64.8 percent, followed by Black, Hispanic, and Asian workers, who comprise 24.9, 6.0, and 3.1 percent of the sample, respectively. The percentage of manufacturing workers who speak English well is 97.2.

Table 5.2. Descriptive Statistics for Place-of-residence Earnings Model

Dependent Variable	Min.	Max.	Mean	St. dev.
EARNINGS (Individual annual earnings in 2010 dollars)	4	422772	42160	48696
ln(EARNINGS) (Natural logarithm of individual annual earnings in 2010 dollars)	1.620	12.955	10.084	1.263

Independent Variable		Min.	Max.	Mean	St. dev.
Category	Name				
Employment	FDIEMP (PUMA total manufacturing FDI employees in 1000's)	0.043	13.571	2.870	3.092
	DOMEEMP (PUMA total domestic manufacturing employees in 1000's)	2.276	70.077	20.665	18.548
Age	AGE	16.000	92.000	41.311	13.865
	AGE2 (Age squared)	256.000	8464.000	1898.857	1194.014
Education Attainment	LESS HIGHSCHOOL	0.000	1.000	0.102	0.302
	HIGHSCHOOL	0.000	1.000	0.353	0.478
	COLLEGE	0.000	1.000	0.234	0.423
	BACHELOR	0.000	1.000	0.197	0.398
	GRADUATE	0.000	1.000	0.114	0.318
Race/ Ethnicity	WHITE	0.000	1.000	0.648	0.478
	BLACK	0.000	1.000	0.249	0.432
	ASIAN	0.000	1.000	0.031	0.173
	HISPANIC	0.000	1.000	0.060	0.237
Gender	MALE	0.000	1.000	0.509	0.500
	FEMALE	0.000	1.000	0.491	0.500
Language Proficiency	NONENGLISH (Does not speak English)	0.000	1.000	0.028	0.164
	ENGLISH (Speaks well)	0.000	1.000	0.972	0.164
Occupation	OCC1 (Management)	0.000	1.000	0.098	0.298
	OCC2 (Business and Financial Operations)	0.000	1.000	0.047	0.212
	OCC3 (Computer and Mathematical)	0.000	1.000	0.025	0.155
	OCC4 (Architecture and Engineering)	0.000	1.000	0.016	0.127
	OCC5(Life, Physical, and Social Science)	0.000	1.000	0.008	0.090
	OCC6 (Community and Social Service)	0.000	1.000	0.016	0.126
	OCC7 (Legal)	0.000	1.000	0.010	0.098
	OCC8 (Education, Training, and Library)	0.000	1.000	0.072	0.258
	OCC9 (Arts, Design, Entertainment, Sports, and Media)	0.000	1.000	0.015	0.123
	OCC10 (Healthcare Practitioners and Technical)	0.000	1.000	0.049	0.216
	OCC11 (Healthcare Support)	0.000	1.000	0.017	0.131
	OCC12 (Protective Service)	0.000	1.000	0.023	0.151
	OCC13 (Food Preparation and Serving Related)	0.000	1.000	0.053	0.224
	OCC14 (Building & Grounds Cleaning & Maintenance)	0.000	1.000	0.032	0.176
	OCC15 (Personal Care and Service)	0.000	1.000	0.025	0.155
	OCC16 (Sales and Related)	0.000	1.000	0.117	0.322
	OCC17 (Office and Administrative Support)	0.000	1.000	0.146	0.354
	OCC18 (Farming, Fishing, and Forestry)	0.000	1.000	0.048	0.214
	OCC19 (Construction and Extraction)	0.000	1.000	0.000	0.021
	OCC20 (Installation, Maintenance, and Repair)	0.000	1.000	0.037	0.188
	OCC21 (Production)	0.000	1.000	0.064	0.245
	OCC22 (Transportation and Material Moving)	0.000	1.000	0.074	0.261

Table 5.2. Descriptive Statistics for Place-of-residence Earnings Model (Cont.)

Independent Variable		Min.	Max.	Mean	St. dev.
Category	Name				
Industry	IND1 (Agriculture, Forestry, Fishing and Hunting)	0.000	1.000	0.009	0.097
	IND2 (Mining)	0.000	1.000	0.001	0.037
	IND3 (Utilities)	0.000	1.000	0.010	0.098
	IND4 (Construction)	0.000	1.000	0.064	0.245
	IND5 (Manufacturing)	0.000	1.000	0.115	0.320
	IND6 (Wholesale Trade)	0.000	1.000	0.033	0.180
	IND7 (Retail Trade)	0.000	1.000	0.117	0.322
	IND8 (Transportation and Warehousing)	0.000	1.000	0.048	0.214
	IND9 (Information and Communications)	0.000	1.000	0.027	0.163
	IND10 (Finance, Insurance, Real Estate, & Rental & Leasing)	0.000	1.000	0.065	0.246
	IND11 (Professional, Scientific, Management, Administrative, and Waste Management Services)	0.000	1.000	0.102	0.302
	IND12 (Educational, Health and Social Services)	0.000	1.000	0.211	0.408
	IND13 (Arts, Entertainment, Recreation, Accommodations, and Food Services)	0.000	1.000	0.084	0.278
	IND14 (Other Services (Except Public Administration))	0.000	1.000	0.043	0.203
	IND15 (Public Administration)	0.000	1.000	0.056	0.230
	IND16 (Active Duty Military)	0.000	1.000	0.013	0.113
Spatial-dummy (Place-of-residence PUMA)	RESPUMA00100	0.000	1.000	0.016	0.127
	RESPUMA00200	0.000	1.000	0.020	0.141
	RESPUMA00300	0.000	1.000	0.019	0.136
	RESPUMA00400	0.000	1.000	0.017	0.128
	RESPUMA00500	0.000	1.000	0.022	0.148
	RESPUMA00600	0.000	1.000	0.018	0.135
	RESPUMA00700	0.000	1.000	0.021	0.142
	RESPUMA00800	0.000	1.000	0.022	0.148
	RESPUMA00900	0.000	1.000	0.013	0.115
	RESPUMA01000	0.000	1.000	0.013	0.112
	RESPUMA01100	0.000	1.000	0.092	0.289
	RESPUMA01200	0.000	1.000	0.072	0.259
	RESPUMA01300	0.000	1.000	0.076	0.265
	RESPUMA01400	0.000	1.000	0.025	0.155
	RESPUMA01500	0.000	1.000	0.082	0.275
	RESPUMA01600	0.000	1.000	0.019	0.136
	RESPUMA01700	0.000	1.000	0.020	0.141
	RESPUMA01800	0.000	1.000	0.025	0.155
	RESPUMA01900	0.000	1.000	0.024	0.153
	RESPUMA02000	0.000	1.000	0.034	0.181
	RESPUMA02100	0.000	1.000	0.018	0.135
	RESPUMA02200	0.000	1.000	0.012	0.109
	RESPUMA02300	0.000	1.000	0.020	0.139
	RESPUMA02400	0.000	1.000	0.015	0.120
	RESPUMA02500	0.000	1.000	0.013	0.113
	RESPUMA02600	0.000	1.000	0.015	0.123

Table 5.2. Descriptive Statistics for Place-of-residence Earnings Model (Cont.)

Independent Variable		Min.	Max.	Mean	St. dev.
Category	Name				
Spatial-dummy (Place-of-residence PUMA)	RESPUMA02700	0.000	1.000	0.015	0.121
	RESPUMA02800	0.000	1.000	0.020	0.141
	RESPUMA02900	0.000	1.000	0.016	0.126
	RESPUMA03000	0.000	1.000	0.022	0.147
	RESPUMA03100	0.000	1.000	0.012	0.110
	RESPUMA03200	0.000	1.000	0.011	0.104
	RESPUMA03300	0.000	1.000	0.018	0.134
	RESPUMA03400	0.000	1.000	0.014	0.118
	RESPUMA03500	0.000	1.000	0.014	0.118
	RESPUMA03600	0.000	1.000	0.017	0.131
	RESPUMA03700	0.000	1.000	0.013	0.112
	RESPUMA03800	0.000	1.000	0.014	0.119
	RESPUMA03900	0.000	1.000	0.012	0.109
	RESPUMA04000	0.000	1.000	0.013	0.112
	RESPUMA04100	0.000	1.000	0.016	0.124
	RESPUMA04200	0.000	1.000	0.012	0.111
	RESPUMA04300	0.000	1.000	0.016	0.126
Time-dummy	YEAR2004	0.000	1.000	0.139	0.346
	YEAR2005	0.000	1.000	0.146	0.353
	YEAR2006	0.000	1.000	0.147	0.355
	YEAR2007	0.000	1.000	0.149	0.356
	YEAR2008	0.000	1.000	0.145	0.353
	YEAR2009	0.000	1.000	0.140	0.347
	YEAR2010	0.000	1.000	0.133	0.339

* N=315,753

5.2. Results and Discussions

5.2.1. Place-of-work Earnings Model

Before reporting quantile regression results, the study first turns to the estimate results of OLS regression of the place-of-work earnings equation. The estimate results in Table 5.3 show that both foreign and domestic manufacturing employments are positively associated with individual earnings. This means that each additional job in either a foreign or a domestic manufacturing plant is associated with an increase in the earnings of those who work in the manufacturing sector. However, the coefficient of manufacturing FDI employment is larger than that of domestic employment, suggesting that manufacturing workers' earnings are more highly sensitive to manufacturing FDI concentration than domestic. The addition of 1,000 jobs in manufacturing FDI is associated with a 1.99 percent increase in earnings while the same increase in domestic manufacturing employment is associated with only a 0.26 percent increase in earnings.[13]

What explains this difference? As discussed above, a significant portion of manufacturing FDI jobs occur in the high-tech sector, which requires higher productivity and thus provides higher wages. In addition, foreign manufacturing firms may have hiring practices or strategies that differ from those of domestic manufacturing firms. Foreign manufacturers may pay higher wages to attract better workers in a labor market

[13] To check the sensitivity of the model, this study estimates the earnings model with the dependent variable expressed in levels rather than in the natural log. In this specification, both the coefficients on manufacturing FDI employees and domestic manufacturing employees are positive but only the coefficients on manufacturing FDI employees is statistically significant at the 10 percent level. The estimate results suggest that each additional employee in a foreign manufacturing plant is associated with about a $1.12 increase in annual earnings for all manufacturing workers in the same industry in the same community. In contrast, each additional domestic manufacturing employee is associated with less than a 1-cent increase in annual earnings for all manufacturing workers employed in that industry in the community.

with which they are unfamiliar (Figlio & Blonigen, 2000). However, the standardized coefficients (beta coefficients) suggest that both foreign and domestic manufacturing employments do not have a strong effect on the workers' earnings, compared to the individual characteristics variables.

For the individual characteristics variables, the estimate results match those found by most other studies (Buchinsky, 1994). Age has a positively significant impact on individual earnings. Manufacturing workers whose highest education level is high school, some college, a bachelor's degree, or a graduate degree make 14.95, 24.96, 52.04, and 73.80 percent more, respectively, than those without a high school diploma. Compared to the reference group (White), non-White workers earn less. Female workers receive lower wages than do male workers with similar job qualifications. Workers who are proficient in speaking English make 14.68 percent more than those who do not speak English.

Table 5.3. OLS Regression Result for Place-of-work Earnings Model

Dependent Variable		OLS		
Category	Name	Coef.	t	Beta
Employment	FDIEMP (PUMA total manufacturing FDI employees in 1000's)	0.0199***	2.74	0.0143
	DOMEEMP (PUMA total domestic manufacturing employees in 1000's)	0.0026***	3.00	0.0196
Age	AGE	0.0527***	31.44	0.8920
	AGE2	-0.0005***	-26.48	-0.7507
Education Attainment	HIGHSCHOOL	0.1495***	15.04	0.1108
	COLLEGE	0.2496***	21.54	0.1456
	BACHELOR	0.5204***	39.37	0.2913
	GRADUATE	0.7380***	44.94	0.2696
Race/ Ethnicity	BLACK	-0.1672***	-21.72	-0.1035
	ASIAN	-0.1567***	-8.99	-0.0408
	HISPANIC	-0.1685***	-12.60	-0.0686
Gender	FEMALE	-0.2569***	-38.37	-0.1767
Language Proficiency	ENGLISH	0.1468***	8.38	0.0452
CONS		9.4460***	193.30	
Model Summary	Number of observations	25363		
	R-squared	0.542		

Note: Occupation dummies, Industry dummies, Spatial-dummies, and Time-dummies included
*** p<0.01, ** p<0.05, * p<0.1

The above OLS regression model relies on mean regression analysis, which estimates the average earnings equation conditional on the covariates. Meanwhile, quantile regression estimates the earnings equation in various conditional quantiles of earnings, and thus this study can develop a more detailed earnings model that estimates the earnings distribution effects of concentrated manufacturing FDI on all different levels of earnings groups. The study estimates quantile earnings models using nine different quantile levels–10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, and 90%.

Table 5.4 represents the coefficients and associated t-statistics for both OLS and quantile regressions. The most striking result is that the distribution effects of manufacturing FDI at the nine quantiles differ significantly. The coefficients of manufacturing FDI employees are positive and significant in all cases except for the 60% to 90% quantile. In general, a downward trend of coefficients of manufacturing FDI employees appears from the lower to the middle quantile, and then the coefficients slightly increase from the middle to the higher quantile. The study reveals similar patterns in the coefficients of domestic manufacturing employees. However, the estimate results indicate that the coefficients of manufacturing FDI employees are greater than those of domestic employees over the range of all quantiles.

While many previous studies identified manufacturing's historical role as a prime source for middle class jobs, the estimations from the quantile regressions suggest that lower quantile (lower earnings group) are more highly sensitive to both foreign and domestic manufacturing employment levels. In other words, manufacturing FDI job growth has progressive distribution effects. Although the concentration of manufacturing FDI does not have a huge impact on the middle earnings group, compared to other earnings groups, the result suggests that it may reduce earnings inequality among people.

Table 5.4. OLS and Quantile Regression Results for Place-of-work Earnings Model

Category	Dependent Variable	OLS	Quantile Regression								
			10th	20th	30th	40th	50th	60th	70th	80th	90th
Employment	FDIEMP	0.0199*** (2.74)	0.0450*** (3.58)	0.0361*** (3.74)	0.0265*** (3.15)	0.0189** (2.43)	0.0142* (1.84)	0.0108 (1.36)	0.0086 (1.07)	0.0100 (1.09)	0.0147 (1.09)
	DOMEEMP	0.0026*** (3.00)	0.0045*** (3.00)	0.0034*** (2.90)	0.0020** (1.97)	0.0019** (2.00)	0.0021** (2.33)	0.0011 (1.17)	0.0011 (1.16)	0.0017 (1.58)	0.0020 (1.27)
Age	AGE	0.0527*** (31.44)	0.0590*** (20.30)	0.0526*** (23.53)	0.0538*** (27.66)	0.0527*** (29.28)	0.0499*** (28.07)	0.0502*** (27.43)	0.0493*** (26.69)	0.0460*** (21.83)	0.0465*** (14.97)
	AGE2	-0.0005*** (-26.48)	-0.0006*** (-17.89)	-0.0005*** (-20.44)	-0.0005*** (-23.97)	-0.0005*** (-25.30)	-0.0005*** (-23.92)	-0.0005*** (-23.17)	-0.0005*** (-22.26)	-0.0004*** (-17.62)	-0.0004*** (-11.88)
Education Attainment	HIGHSCHOOL	0.1495*** (15.04)	0.1478*** (8.57)	0.1499*** (11.30)	0.1482*** (12.84)	0.1466*** (13.73)	0.1536*** (14.55)	0.1474*** (13.58)	0.1453*** (13.26)	0.1423*** (11.37)	0.1385*** (7.51)
	COLLEGE	0.2496*** (21.54)	0.2394*** (11.91)	0.2450*** (15.84)	0.2511*** (18.67)	0.2467*** (19.81)	0.2575*** (20.92)	0.2507*** (19.80)	0.2529*** (19.80)	0.2524*** (17.30)	0.2448*** (11.39)
	BACHELOR	0.5204*** (39.37)	0.4322*** (18.85)	0.4753*** (26.95)	0.4976*** (32.43)	0.5117*** (36.03)	0.5253*** (37.43)	0.5302*** (36.72)	0.5469*** (37.54)	0.5517*** (33.17)	0.5880*** (23.98)
	GRADUATE	0.7380*** (44.94)	0.6703*** (23.53)	0.6945*** (31.70)	0.7186*** (37.70)	0.7167*** (40.62)	0.7295*** (41.83)	0.7230*** (40.31)	0.7286*** (40.25)	0.7488*** (36.23)	0.8546*** (28.05)
Race/ Ethnicity	BLACK	-0.1672*** (-21.72)	-0.1813*** (-13.57)	-0.1654*** (-16.10)	-0.1578*** (-17.66)	-0.1647*** (-19.91)	-0.1523*** (-18.62)	-0.1551*** (-18.45)	-0.1486*** (-17.52)	-0.1466*** (-15.14)	-0.1493*** (-10.46)
	ASIAN	-0.1567*** (-8.99)	-0.1719*** (-5.69)	-0.1399*** (-6.02)	-0.1453*** (-7.18)	-0.1532*** (-8.19)	-0.1532*** (-8.28)	-0.1641*** (-8.62)	-0.1524*** (-7.94)	-0.1334*** (-6.08)	-0.1398*** (-4.33)
	HISPANIC	-0.1685*** (-12.60)	-0.1969*** (-8.49)	-0.1793*** (-10.05)	-0.1789*** (-11.53)	-0.1710*** (-11.91)	-0.1609*** (-11.33)	-0.1609*** (-11.02)	-0.1670*** (-11.33)	-0.1777*** (-10.57)	-0.1893*** (-7.63)
Gender	FEMALE	-0.2569*** (-38.37)	-0.2278*** (-19.61)	-0.2416*** (-27.04)	-0.2523*** (-32.45)	-0.2555*** (-35.51)	-0.2583*** (-36.32)	-0.2633*** (-35.99)	-0.2680*** (-36.31)	-0.2750*** (-32.63)	-0.2805*** (-22.58)
Language Proficiency	ENGLISH	0.1468*** (8.38)	0.1200*** (3.95)	0.1265*** (5.41)	0.1409*** (6.93)	0.1491*** (7.92)	0.1491*** (8.01)	0.1419*** (7.42)	0.1335*** (6.91)	0.1320*** (5.99)	0.1504*** (4.63)
CONS		9.4460*** (193.30)	8.9032*** (105.02)	9.1929*** (140.99)	9.2313*** (162.72)	9.3560*** (178.18)	9.4629*** (182.34)	9.5651*** (179.20)	9.7118*** (180.30)	9.8749*** (160.58)	10.1159*** (111.59)
Model Summary	Number of obs.	25363	25363	25363	25363	25363	25363	25363	25363	25363	25363
	R2 (Pseudo R2)	0.542	0.252	0.298	0.326	0.347	0.362	0.372	0.381	0.386	0.384

Note: Occupation dummies, Spatial-dummies, and Time-dummies included
t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2.2. Place-of-residence Earnings Model

The study further examines whether and how the concentration of manufacturing FDI in a certain community has an indirect impact on the earnings of those who live in the area. Table 5.5 presents the estimates result of OLS regression for the place-of-resident earning model. Although only manufacturing FDI jobs are statistically significant at the 10 percent level, both foreign and domestic manufacturing employments are positively associated with individual earnings, suggesting that each additional job in both foreign and domestic manufacturing plants in a particular community is associated with an increase in earnings for those who live in the area.

The coefficient of manufacturing FDI employees is larger than that of domestic employees, meaning that resident earnings are more highly sensitive to manufacturing FDI concentration than domestic. In addition, the magnitudes are smaller than those found in the place-of-work earnings model. The addition of 1,000 jobs in manufacturing FDI is associated with a 0.63 percent increase in earnings, and the same increase in domestic manufacturing employment is associated with a 0.11 percent increase in earnings. However, small standardized coefficients (beta coefficients) for both foreign and domestic manufacturing employments, compared to those for the individual characteristics variables, indicate that the place-of-residence effects of both foreign and domestic manufacturing employment are not strong.

Age has a positively significant impact on individual earnings. Manufacturing workers whose highest education level is high school, some college, a bachelor's degree, or a graduate degree make 34.8, 45.1, 75.0, and 102.6 percent more, respectively, than those without a high school diploma. The magnitude of the effect based on level of education attainments is substantial. Compared to the reference group (White), Blacks, Asian, and Hispanics earn 15.1, 14.1, and 1.5 percent less, respectively. Male workers earn more than do female workers with similar job qualifications. The coefficient of English-language proficiency is a negative but is not statistically significant.

Table 5.5. OLS Regression Result for Place-of-residence Earnings Model

Dependent Variable		OLS		
Category	Name	Coef.	t	Beta
Employment	FDIEMP (PUMA total manufacturing FDI employees in 1000's)	0.0063*	1.68	0.0155
	DOMEEMP (PUMA total domestic manufacturing employees in 1000's)	0.0011	1.34	0.0159
Age	AGE	0.1634***	224.55	1.7928
	AGE2	-0.0017***	-202.96	-1.6022
Education Attainment	HIGHSCHOOL	0.3477***	54.1	0.1316
	COLLEGE	0.4511***	64.16	0.1512
	BACHELOR	0.7497***	97.01	0.2359
	GRADUATE	1.0260***	115.38	0.2585
Race/ Ethnicity	BLACK	-0.1509***	-34.08	-0.0516
	ASIAN	-0.1407***	-13.65	-0.0192
	HISPANIC	-0.0149*	-1.74	-0.0028
Gender	FEMALE	-0.3569***	-89.31	-0.1412
Language Proficiency	ENGLISH	-0.0070	-0.57	-0.0009
CONS		6.2016***	204.14	-
Model Summary	Number of observations	315753		
	R-squared	0.424		

Note: Occupation dummies, Industry dummies, Spatial-dummies, and Time-dummies included
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

To estimate earnings distribution effects for the different earnings groups, the study performs quantile regressions at nine different quantile levels from 10 to 90 percent. Table 5.6 represents the coefficients and associated t-statistics for both OLS and quantile regressions. The estimate results indicate that the coefficients of manufacturing FDI employees are greater than those of domestic employees over all of the range of quantile. Coefficients on both manufacturing FDI and domestic manufacturing employee variables are positive but not statistically significant except for the 70% quantile.

Despite these statistically insignificant results, the magnitudes of manufacturing FDI employees increase at the middle quantile. This result supports the assumption in this study that location of manufacturing FDI–relative to U.S. domestic manufacturing location–in a community had a positive influence on individual earnings for the middle class workers who lived in that community from 2005-2010, compared to other classes. However, the fact that only the 70% quantile is statistically significant may indicate that manufacturing FDI may actually have a regressive distribution effect.

Table 5.6. OLS and Quantile Regression Results for Place-of-resident Earnings Model

Category	Dependent Variable	OLS	Quantile Regression								
			10th	20th	30th	40th	50th	60th	70th	80th	90th
Employment	FDIEMP	0.0063*	0.0037	0.0040	0.0052	0.0057	0.0050	0.0041	0.0061**	0.0033	0.0026
		(1.68)	(0.35)	(0.61)	(1.11)	(1.43)	(1.48)	(1.36)	(2.12)	(1.10)	(0.71)
	DOMEEMP	0.0011	-0.0003	0.0009	0.0014	0.0015*	0.0011	0.0008	0.0011*	0.0003	0.0009
		(1.34)	(-0.11)	(0.63)	(1.35)	(1.75)	(1.57)	(1.22)	(1.83)	(0.45)	(1.13)
Age	AGE	0.1634***	0.2522***	0.2217***	0.1890***	0.1642***	0.1424***	0.1257***	0.1121***	0.1004***	0.0896***
		(224.55)	(125.66)	(176.23)	(208.11)	(212.58)	(218.36)	(213.79)	(201.38)	(172.80)	(125.56)
	AGE2	-0.0017***	-0.0027***	-0.0024***	-0.0020***	-0.0017***	-0.0015***	-0.0013***	-0.0011***	-0.0010***	-0.0009***
		(-202.96)	(-117.65)	(-163.44)	(-191.47)	(-194.35)	(-198.03)	(-192.13)	(-178.94)	(-150.89)	(-106.63)
Education Attainment	HIGHSCHOOL	0.3477***	0.4447***	0.4070***	0.3739***	0.3468***	0.3091***	0.2853***	0.2539***	0.2260***	0.1942***
		(54.10)	(25.07)	(36.62)	(46.58)	(50.80)	(53.63)	(54.89)	(51.62)	(44.03)	(30.82)
	COLLEGE	0.4511***	0.5385***	0.5087***	0.4796***	0.4579***	0.4224***	0.3950***	0.3607***	0.3363***	0.3001***
		(64.16)	(27.76)	(41.84)	(54.62)	(61.31)	(66.99)	(69.47)	(67.02)	(59.90)	(43.52)
	BACHELOR	0.7497***	0.7900***	0.7709***	0.7643***	0.7478***	0.7112***	0.6818***	0.6521***	0.6296***	0.6059***
		(97.01)	(37.05)	(57.69)	(79.21)	(91.11)	(102.63)	(109.12)	(110.25)	(102.05)	(79.96)
	GRADUATE	1.0260***	1.0525***	1.0398***	1.0386***	1.0116***	0.9696***	0.9389***	0.9006***	0.8767***	0.8693***
		(115.38)	(42.90)	(67.63)	(93.54)	(107.10)	(121.60)	(130.59)	(132.33)	(123.50)	(99.70)
Race/ Ethnicity	BLACK	-0.1509***	-0.1844***	-0.1537***	-0.1470***	-0.1505***	-0.1571***	-0.1545***	-0.1564***	-0.1556***	-0.1590***
		(-34.08)	(-15.09)	(-20.07)	(-26.59)	(-32.01)	(-39.57)	(-43.15)	(-46.15)	(-44.01)	(-36.61)
	ASIAN	-0.1407***	-0.1863***	-0.1937***	-0.1778***	-0.1579***	-0.1487***	-0.1399***	-0.1396***	-0.1291***	-0.1033***
		(-13.65)	(-6.55)	(-10.87)	(-13.82)	(-14.43)	(-16.10)	(-16.79)	(-17.70)	(-15.70)	(-10.22)
	HISPANIC	-0.0149*	0.0090	-0.0295**	-0.0497***	-0.0590***	-0.0726***	-0.0753***	-0.0920***	-0.0918***	-0.0982***
		(-1.74)	(0.38)	(-1.98)	(-4.63)	(-6.47)	(-9.42)	(-10.85)	(-14.00)	(-13.40)	(-11.67)
Gender	FEMALE	-0.3569***	-0.4570***	-0.3673***	-0.3329***	-0.3103***	-0.2991***	-0.2935***	-0.2929***	-0.3068***	-0.3352***
		(-89.31)	(-41.44)	(-53.15)	(-66.71)	(-73.12)	(-83.47)	(-90.84)	(-95.77)	(-96.17)	(-85.54)
Language Proficiency	ENGLISH	-0.0070	-0.1098***	-0.0413*	0.0028	0.0340***	0.0652***	0.0881***	0.0931***	0.1114***	0.1555***
		(-0.57)	(-3.24)	(-1.94)	(0.18)	(2.60)	(5.91)	(8.86)	(9.89)	(11.34)	(12.89)
CONS		6.2016***	3.1614***	4.3062***	5.3382***	6.1055***	6.7772***	7.3249***	7.8081***	8.2692***	8.7663***
		(204.14)	(37.72)	(81.99)	(140.73)	(189.24)	(248.80)	(298.22)	(335.83)	(340.98)	(294.30)
Model Summary	Number of Observations	315753	315753	315753	315753	315753	315753	315753	315753	315753	315753
	R2 (Pseudo R2)	0.4238	0.2662	0.2782	0.2780	0.2762	0.2760	0.2779	0.2798	0.2828	0.2900

Note: Occupation dummies, Industry dummies, Spatial-dummies, and Time-dummies included
t-statistics in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

CHAPTER 6

CONCLUSION AND POLICY IMPLICATIONS

6.1. Conclusion

The goal of this study is to identify whether and how FDI contributes to SLED. By selecting Georgia as a case study area, the study specifically examines intra-regional spatial patterns of manufacturing FDI and their underlying locational factors. It also examines earnings distribution effects of manufacturing FDI concentration among different earnings groups. The results in the study suggest that manufacturing FDI could promote SLED's essential four principles: establishing a minimum standard of living for all and increasing the standard over time; reducing growing inequality among people; reducing spatial inequality; and promoting and encouraging sustainable resource use and production.

The study confirms that in the past, location of manufacturing FDI has increased spatial inequality at both intra-state and intra-metropolitan levels. First, the study identifies a strong spatial concentration of manufacturing FDI employment in the Atlanta MSA, the largest MSA in the state, at the intra-state spatial pattern analysis. There was an annual average of 800 foreign firms in the manufacturing sector in Georgia, and they provided an annual average of 70,000 jobs from 1990 to 2010. These manufacturing FDI jobs were relatively stable, while domestic manufacturing experienced significant job loss over the last two decades. However, the distribution of job creations was not even across the counties within the state. The manufacturing FDI jobs tended to concentrate in metropolitan areas, especially in the 28-county Atlanta MSA. While Helper et al. (2012a)'s study found long-term exurbanization patterns of manufacturing jobs, this study revealed a significant increase in manufacturing FDI jobs in metropolitan areas and a spatial pattern differentiation between foreign and domestic manufacturing. Further, the results of spatial statistics analysis, such as mean center, standard distance, global Moran's *I*, and Hot Spot analyses, suggest the spatial concentration of manufacturing FDI jobs in Atlanta MSA has strengthened over the last two decades.

To investigate intra-state locational factors determining the strong clusters of manufacturing FDI jobs in the large metropolitan area over time, the study conducts a panel regression analysis. The results of the analysis confirm that the presence of agglomeration economies in metropolitan areas, especially in the large metropolitan area of Atlanta, has positively influenced the location of manufacturing FDI jobs over the past two decades. High population density, strong existing manufacturing activities, a pool of skilled workforce, and good transportation systems in a metropolitan area are critical determinants in a foreign manufacturing firm's decision to locate there. Moreover, the result of specific panel analysis shows that foreign manufacturing firms in the high-tech sector tend to locate in counties with a pool of highly educated and trained workforce, as well as good access to and international airport and/or seaport.

Second, the study confirms a suburbanization pattern of manufacturing FDI employment in the intra-metropolitan spatial pattern analysis. Although the manufacturing FDI has concentrated in the Atlanta MSA over time, this concentration has not led to an even distribution of jobs across the 28 counties in the metropolitan area. Manufacturing FDI added about 6,300 additional jobs to the 28-county Atlanta MSA from 1990 to 2010. However, most of the job creation occurred in the northern part of the metropolitan area, while the center of the metropolitan area experienced a significant job loss over time. Mean Center and Standard Deviation Ellipse analysis reveals that manufacturing FDI jobs moved towards the northern areas, and away from the center, of the metropolitan area, indicating a suburbanization of manufacturing FDI jobs. Hot Spot analysis identifies the northeast section of the metropolitan area–in particular, the suburbs of Gwinnett, Cobb and north Fulton Counties–as a hot spot, indicating an emerging job clustering area. Meanwhile, the central areas of the metropolitan area have become a cold spot over time, indicating a decline in such clustering in areas with low manufacturing FDI employment surrounded by other areas with a low employment.

The study conducts another panel regression analysis to investigate intra-metropolitan locational factors determining the suburbanization of manufacturing FDI jobs in a large metropolitan area over time. The results of the analysis confirm that the loss of urban industrial land in the central city within a large metropolitan area is associated with the suburbanization of FDI in manufacturing jobs over time. A 1 percent rise in a county's total industrial land leads to a 0.99 percent increase in manufacturing FDI employment, indicating that counties with small industrial land area appear to have a disadvantage in attracting foreign manufacturers and their jobs.

The study confirms that spatial differentiations exist between foreign and domestic manufacturing firms both at intra-state and intra-metropolitan levels. The intra-state spatial pattern analysis shows a significant increase in manufacturing FDI jobs in the Atlanta MSA between 1990 and 2010, while small MSAs and non-MSAs experienced a loss of jobs in foreign manufacturing firms. In contrast, all these areas lost domestic manufacturing jobs during the same period. The Atlanta MSA, in particular, experienced a significant decline in its domestic manufacturing job share, which fell by 9.7 percent or

2,400 jobs. The intra-metropolitan spatial pattern analysis also reveals different suburbanization patterns for foreign and domestic manufacturing employment over time. Jobs in both foreign and domestic manufacturing firms moved outward to the northern metropolitan areas, especially in Gwinnett, Cobb, and north Fulton Counties. However, the central areas of the metropolitan area still managed to retain a significant number of domestic manufacturing jobs, despite the displacement of manufacturing FDI jobs from those areas.

A panel regression analysis confirms the existence of locational factor differentiations between foreign and domestic manufacturing. While educational attainment is not a statistically significant factor for high-tech and non-high-tech domestic manufacturing, both high-tech and non-high-tech manufacturing FDI prefer counties with a higher level of education attainment. In the intra-metropolitan locational factors analysis, the results suggest that foreign manufacturing firms in the high-tech sector are the least sensitive sector with regard to industrial land area and the greenfield sites generally located in the outskirts of the metropolitan area. Moreover, accessibility to the Atlanta downtown area (ATLANTA) is an important factor for high-tech manufacturing FDI locations, *ceteris paribus*, implying that the central area is a desirable location for firms in high-tech industries. Another interesting finding is the difference in racial preferences between foreign and domestic manufacturing firms. Both foreign and domestic manufacturers (in particular high-tech sector firms) tend to avoid counties with a high Black population density. While the study finds that foreign manufacturers (especially, high-tech manufacturing FDI) prefer locations with a higher percentage of Asian population, domestic manufacturers tend to avoid those counties.

The uneven distribution patterns of manufacturing FDI jobs at both intra-state and intra-metropolitan area levels indicate increased spatial inequality, but the implications of this finding are mixed. At the intra-state level, the study focuses on spatial inequality between metropolitan and non-metropolitan areas, accepting the general consensus that metropolitan areas, especially large metropolitan areas, are engines of American prosperity, offering unique benefits for creating knowledge, innovation, and productivity for sustainable growth (Berube, 2007; Blakely & Leigh, 2010; Helper et al., 2012a; Istrate & Marchio, 2012). Historically, metropolitan areas were home to manufacturing job clusters by providing the great advantages of agglomeration in those areas, such as a pool of skilled labor, specialized inputs in the form of local goods and services suppliers, and knowledge spillover. The location of manufacturing firms in metropolitan areas provides an especially important opportunity to create jobs in urban neighborhoods, especially for the middle class. While domestic manufacturing jobs have moved away from these areas over the past few decades, the concentration of foreign manufacturing firms in metropolitan areas, especially in a large metropolitan area, could fill gaps in manufacturing job loss. Additionally, the spatial concentration of manufacturing FDI could promote sustainable growth by protecting natural resources.

At the intra-metropolitan level, the suburbanization of manufacturing FDI may increase metropolitan inequalities and threaten sustainable resource use and production. The significant loss of industrial land within the urban core has made the central city and inner suburbs less attractive locations for foreign manufacturing firms and has contributed to job sprawl in those industries. This job sprawl typically causes excessive land consumption in rural areas or otherwise undeveloped land at the outskirts of the metropolitan area. It also generates a large volume of traffic and wastes massive amounts of energy. Attracting and retaining manufacturing FDI jobs in central areas instead could promote sustainability through reducing the loss of rural land reserves and improving air and water quality.

Fortunately, one of the interesting findings in this study is that urban core areas are still attractive for high-tech manufacturing FDI firms. Higher land costs and higher wage levels in those areas do not deter the concentration of high-tech manufacturing FDI. These firms require relatively small footprints and can locate in multi-story sites, making them relatively less sensitive to large industrial properties and greenfield sites in rural or exurban areas. Rather, foreign manufacturers in the high-tech sector tend locate their enterprises within, or as close as possible to, more densely populated central areas that usually provide an innovative environment and higher levels of human capital.

Notably, however, high-tech manufacturing FDI prefers locations with a higher concentration of Asian population, and tends to avoid counties with high Black population density. This preference may increase inequality among different race and ethnic groups, which would conflict with one of the main goals in SLED.

The study confirms, nevertheless, that manufacturing FDI generally has reduced inequality among people. Using individual earnings data from the American Community Survey (ACS) Public Use Microdata Sample (PUMS) files, it conducts a quantile regression to estimate the earnings distribution effects that a concentration of manufacturing FDI may have different levels of earnings groups. The study applies two specific analyses: place-of-work and place-of-residence earnings models. First, the place-of-work earnings analysis measures the direct distribution impact that locating manufacturing FDI in a particular community may have on the earnings of those who work in the area. The result of the analysis demonstrates that manufacturing FDI job growth has progressive distribution effects. Compared to other earnings groups, the lower earnings group is more highly sensitive to foreign manufacturing employment levels. Although the concentration of manufacturing FDI does not have a huge impact on the middle earnings group, compared to other earnings groups, the result suggests that it may reduce earnings inequality among people. Similar patterns appear in the coefficients of domestic manufacturing employees, although the estimate results indicate that the coefficients of manufacturing FDI employees are greater than those of domestic employees over the range of all quantiles.

Second, the place-of-residence earnings analysis measures the indirect distribution impact of manufacturing FDI in a certain community on the earnings of those who live in the area. Despite the statistical insignificance, the result of the analysis reveals that the magnitudes of manufacturing FDI employee earnings increase at the middle quantile. This result supports the assumption in this study that location of manufacturing FDI–relative to U.S. domestic manufacturing location–in a community positively influenced the individual earnings of the middle class worker residing in that community from 2005 to 2010, compared to other classes.

This study does not measure inequality directly, but the findings both from place-of-work and place-of-residence earnings analysis suggest strong implications relating to the issue of inequality among people. The concentration of manufacturing FDI in a certain area show the largest distribution effects on area workers in the lower earnings group and residents in the middle earnings group. Therefore, support for manufacturing

FDI jobs is associated with the proliferation of middle and lower class jobs and should be encouraged both for individuals seeking an affordable standard-of-living and for the positive macroeconomic benefits.

6.2. Policy Implications

Based on the key findings of the study, this section proposes several policy implications for planners and policy makers to contribute to SLED.

Strength of the metropolitan area as a home to manufacturing FDI clusters.

One of the major findings of this study is a strong spatial concentration of foreign manufacturing jobs in metropolitan areas, particularly in a large metropolitan area. While concern has arisen in recent years about the amount of manufacturing job losses in major U.S. metropolitan areas, this study demonstrates that foreign manufacturing firms still tend to locate in such areas. Existing agglomerations of innovative firms and institutions, a pool of highly educated workers, highly developed transportation networks, and critical links to domestic and international markets in metropolitan areas provide a key attraction for manufacturing FDI.

Create urban industrial land use planning to attract foreign manufacturing firms that fill gaps left by the suburbanization of manufacturing jobs.

This study finds that the significant loss of urban industrial land in the central city within a large metropolitan area has been associated with the suburbanization of FDI in manufacturing jobs over time. The loss of industrial land may make the central city and inner suburbs less attractive locations for manufacturing and thus may contribute to the job sprawl of manufacturing FDI. Recent literature has expressed concern that current urban revitalization planning and practices in central and inner cities have focused only on commercial and residential, rather than industrial, development (Fitzgerald & Leigh, 2002; Leigh & Hoelzel, 2012; Mistry & Byron, 2011). Further, current initiatives of smart growth or new urbanism fail to ensure coordination with economic development concerns, such as the retention of industrial land and jobs in the central city (Leigh & Hoelzel, 2012).

Planning aimed at preventing the loss of urban industrial sites is critical in terms of job security for local residents, impacts on surrounding communities, and job-resident spatial matching. One study suggested that three quarters of urban industrial workers live in the city, that half of these workers lived within three miles of their plant locations, and that the industrial jobs are "head of household" jobs offering competitive wages and benefits (ICIC, 2013). Because of its multiplier effects, locating and retaining a new manufacturing firm may add a number of new jobs both directly from the firm and indirectly from local suppliers, support and service-providers. Thus, an effective industrial job strategy including the retention of urban industrial sites may reduce job sprawl and provide job opportunities to local residents and surrounding communities. In addition, such a strategy would serve as an energy efficient or environmentally effective tool to combat global warming by reducing the commuting distance for workers.

Several large cities have recently conducted industrial land inventory analyses and established plans and programs for preserving affordable space for urban manufacturers. Seattle, Baltimore, Minneapolis, and Jacksonville have created land use reform plans that protect designated industrial sites from conversion threats (Mistry & Byron, 2011). The Brooklyn Navy Yard in New York City and the Lower Schuylkill River District in Philadelphia were reborn as modern industrial sites (Mistry & Byron, 2011; Wolf-Powers, 2012). Metropolitan areas could tailor these land use and zoning approaches to attract foreign manufacturers in both the high-tech and non-high-tech sectors. For example, they could zone old industrial land sites in central cities for high-tech manufacturing FDI with dense and mixed-land uses, while converting aging industrial and office properties in inner-ring suburbs for traditional (non-high-tech) manufacturing.

Incorporate proactive human resource development to FDI attraction strategy. While traditional local economic development practices have focused on attracting outside firms, an alternative approach emphasizes that human capital and investment in skill and training is becoming a more attractive development approach (Markusen, 2001, 2004, 2008). Florida (2002) suggested that the future of local economies relies on attracting and retaining members of the "creative class," comprised of individuals who work in sectors such as technology, media and entertainment, and finance and whose activities embody creativity, individuality, and difference (Florida, 2002). With the emergence of the knowledge economy, Garmise (2006) argues that economic development as initially practiced was a land-centered phenomenon, and it should be replaced by a people-centered one. The new approach believes that skilled labor is a key engine of the local and regional economy because it increases the productivity and performance of a range of firms and industries.

An article from the New York Times provides strong evidence that the economic vitality of a place depends on the skills of its workforce, explaining that the location of Apple's oversea factories in China cannot be explained solely by the single factor that Chinese workers are cheaper than American workers. One of China's critical advantages is that Foxconn City, where workers assemble Apples' iPhone, provides about 8,700 industrial engineers needed to oversee and guide the 200,000 assembly-line workers. The skilled workforce in that city offers flexibility, diligence, and high skills at a scale the U. S. could not match. The challenge in setting up a U.S. plant is finding qualified engineers with more than a high school diploma, but not necessarily a bachelor's degree (Duhigg & Bradsher, January 21, 2012). Lack of a qualified workforce also presents a significant constraint to attracting foreign firms. When Volkswagen, a Germany automaker, opened a plant in Tennessee in 2011, the company found a dearth of skilled workers, and so it opened a German-style training system with three-year apprenticeships at the factory (Rattner, 2013).

The findings in this study suggest that foreign manufacturing firms, particularly in the high-tech sector, tend to locate in a county with a well-trained and knowledgeable workforce. Accordingly, local neighborhoods with labor force stability and higher levels of human capital could attract more foreign manufacturing firms. In conjunction with SLED practices, FDI attraction policies should encourage a more proactive approach to investing in people and retaining those people.

The Georgia's Quick Start program is an example of a workforce-training program designed to support new and existing businesses in the state. Georgia provided this program to Kia, an auto manufacturer headquartered in South Korea, when they opened their automobile assembly plant in the state in 2006. By making the application process online-only, Quick Start was able to guarantee Kia that they could reduce recruiting costs and time, while simultaneously improving the size and quality of the recruiting pool (Quick Start News, 2008). Quick Start also provided training space, instructors, and all needed materials related to the program, potentially saving the auto company millions of dollars in training costs. With a $25.9 million investment in a 70,000-square-foot building and training curriculum development, the Kia Georgia Training Center opened in 2008. Operated by Quick Start, the training center became the site of Kia's customized training for the company's team members(Quick Start News, Summer 2008).

Adopt "good incentives" strategy for ensuring SLED principles.

The SLED practices should encourage an alternative, socially beneficial incentive policy. Although government incentives can be one of the most important factors influencing locational decisions by foreign manufacturers, concerns arise about the extraordinary burdens on funding future services and the fiscal future of the locality when state or metropolitan policy makers hand over a significant sum of public money to private entities under the guise of competitiveness (Markusen, 2007). Recently, a number of studies have proposed an alternative incentive policy.

Some suggested that a good incentive strategy could establish specific requirements at the state or local level (Helper et al., 2012a; Mattera, Cafcas, McIlvaine, Seifter, & Tarczynska, 2011), including enforceable job creation, minimum job duration, and wage standards requirements. While good incentive strategy generally focuses on job security that provides living wages, it could also emphasize other types of employee benefits by focusing on job quality. These benefits may include healthcare and retirement benefits, paid vacation and sick days, and family/parental leave (Mattera et al., 2011).

In addition, a good incentive strategy could consider environmental sustainability. The state and local industrial authorities could assist foreign firms to locate within metropolitan areas and central cities in the metropolitan area through their business subsidies, by providing incentives promoting the reuse of previously developed properties and vacant urban land.

Many state and local economic development agencies provide an interactive, web-based industrial site search system. For example, the Georgia Ready for Accelerated Development (GRAD) Sites program provides a web-based map for pre-qualified, available, shovel-ready industrial sites in Georgia. The website relies on extensive databases of available properties with detailed information on buildings, industrial/commercial sites, parks and greenfield sites.[14] However, it contains no links to sites highlighting metropolitan areas and central city areas, especially old urban industrial sites. Optimally, state and local planners could use this industrial site search system to encourage foreign firms to choose brownfield sites or industrial and office property reuse sites within urban core areas with public incentives. This strategy not only could provide job opportunities in poor urban neighborhoods and increase tax revenue in the short-term, but it could also promote environmental sustainability by slowing greenfield consumption and suburbanization (or exurbanization) of manufacturing activities (Fitzgerald & Leigh, 2002).

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[14] Georgia Ready for Accelerated Development (GRAD) Sites (http://georgiaemc.zoomprospector.com/?sa=626&MODE=SITES). See also Georgia Power's (http://www.selectgeorgiaprospector.com/) and Electric Cities of Georgia's site search website (http://www.locationgeorgia.com/properties/industrial)

Conduct additional research to investigate the linkage between immigrant communities and FDI at the intra-regional level.

One of the most interesting results uncovered in this study is the racial preferences of manufacturing FDI. In particular, foreign manufacturing firms in the high-tech sector prefer locations with a higher concentration of Asian population, but they tend to avoid counties with high black population density. The intra-metropolitan spatial pattern analysis identifies the suburbs of Gwinnett, Cobb and Fulton counties–where a large number of Asians reside–have as an emerging job cluster of high-tech manufacturing FDI, and this job cluster has been strong over the past two decades. The racial preferences of manufacturing FDI may be associated with the distribution of immigration groups. The presence of a strong Asian migrant community may make it a magnet for foreign companies from South Korea, Japan, and China. Some studies found a positive relationship between immigrant networks and FDI, and argued that ethnic networks lower the risk of FDI by reducing informational costs (Bhattacharya & Groznik, 2008; Buch, Kleinert, & Toubal, 2006; Foad, 2012; Javorcik, Özden, Spatareanu, & Neagu, 2011). However, these studies, conducted at the international or interstate level, fail to provide empirical evidence regarding how and why local immigration networks influence the location decision of foreign firms at the intra-regional level. Therefore, additional studies are necessary to examine how the presence of a strong Asian community in the Atlanta metropolitan area relates to the higher concentration of manufacturing FDI in the same area.

APPENDIX A

HIGH-TECH MANUFACTURING IN GEORGIA

Table A.1. High-tech Manufacturing in Georgia

Level	Definition	NAICS	Industry	High-Tech Manufacturing Employment								
				All			Domestic.			Foreign		
				1990	2000	2010	1990	2000	2010	1990	2000	2010
1	Industries with a concentration of science, engineering, and technician occupations that was at least 5.0 times greater than the average for all industries	3254	Pharmaceutical and medicine manufacturing	2,030	3,005	4,621	1,098	1,058	2,015	932	1,947	2,606
		3341	Computer and peripheral equipment mfg.	6,303	7,618	3,548	6,119	7,222	3,014	184	396	534
		3342	Communications equipment manufacturing	13,510	20,594	12,438	10,246	18,923	11,287	3,264	1,671	1,151
		3344	Semiconductor and other electronic component	2,566	5,286	3,010	2,075	3,623	2,362	491	1,663	648
		3345	Navigational, measuring, electromedical, control inst. mfg.	5,999	9,739	7,786	3,869	7,368	6,632	2,130	2,371	1,154
		3364	Aerospace product and parts manufacturing	25,780	28,203	14,859	24,879	27,643	13,914	901	560	945
		Sub-total		56,188	74,445	46,262	48,286	65,837	39,224	7,902	8,608	7,038
2	Industries with a concentration of science, engineering, and technician occupations that was 3.0 to 4.9 times the average for all industries	3251	Basic chemical manufacturing	8,204	9,593	6,943	6,256	7,925	4,153	1,948	1,668	2,790
		3252	Resin, synthetic fiber, artificial synthetic fiber/filament mfg.	3,947	4,661	4,067	2,890	3,468	3,693	1,057	1,193	374
		3332	Industrial machinery manufacturing	6,517	5,911	5,557	4,728	4,721	4,009	1,789	1,190	1,548
		3333	Commercial and service industry machinery mfg.	3,231	3,046	5,124	2,312	2,415	2,795	919	631	2,329
		3343	Audio and video equipment manufacturing	2,227	1,057	496	97	201	421	2,130	856	75
		3346	Mfg. and reproducing magnetic and optical media	2,481	2,235	769	434	905	561	2,047	1,330	208
		Sub-total		26,607	26,503	22,956	16,717	19,635	15,632	9,890	6,868	7,324
3	Industries with a concentration of science, engineering, and technician occupations that was 2.0 to 2.9 times the average for all industries.	3241	Petroleum and coal products manufacturing	2,487	2,122	1,635	2,020	1,666	1,061	467	456	574
		3253	Pesticide, fertilizer, other agricultural chemical mfg.	2,134	3,438	2,258	1,888	2,671	1,675	246	767	583
		3255	Paint, coating, and adhesive manufacturing	2,956	2,672	3,477	2,615	2,244	3,155	341	428	322
		3259	Other chemical product and preparation manufacturing	2,446	2,981	3,468	1,833	1,824	2,858	613	1,157	610
		3336	Engine, turbine, and power transmission equipment mfg.	871	1,911	2,155	801	1,544	1,915	70	367	240
		3339	Other general purpose machinery manufacturing	5,742	8,479	7,525	4,718	6,983	5,737	1,024	1,496	1,788
		3353	Electrical equipment manufacturing	7,300	11,397	6,566	5,991	10,273	5,625	1,309	1,124	941
		3369	Other transportation equipment manufacturing	967	1,354	1,918	92	254	692	875	1,100	1,226
		Sub-total		24,903	34,354	29,002	19,958	27,459	22,718	4,945	6,895	6,284

Total Manufacturing Employment (A)	667,723	705,844	523,852	602,214	633,104	459,161	65,509	72,740	64,691
Total High-Tech Manufacturing Employment (B)	107,698	135,302	98,220	84,961	112,931	77,574	22,737	22,371	20,646
Percentage (B/A)	16.1%)	19.2%)	18.7%)	14.1%)	17.8%)	16.9%)	34.7%)	30.8%)	31.9%)

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